A82 Dalnottar – Inverness Trunk Road

A82 Ba Bridge Replacement

Environmental Statement

2009

TRANSPORT SCOTLAND

An agency of The Scottish Government

ScotlandTranServ

A Balfour Beatty Mouchel Joint Venture

A82 Dalnottar – Inverness Trunk Road

A82 Ba Bridge Replacement

Environmental Statement

5 February 2009

Produced for

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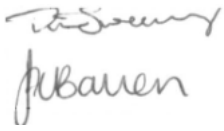
Prepared By *For and on behalf of* Scotland TranServ	Tim Sweeney, Julie Bowen.		12/02/09
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NON-TECHNICAL SUMMARY

1. Project Background

1.1. Introduction

The Scottish Government (Transport Scotland) is proposing to replace Ba Bridge on Rannoch Moor (Figure 1.1) as it is under strength having been found to fail the minimum load carrying capacity for Trunk Roads. The bridge over the River Ba is located within Rannoch Moor Site of Special Scientific Interest (SSSI), Rannoch Moor Special Area of Conservation (SAC), Ben Nevis and Glen Coe National Scenic Area (NSA) and neighbours Rannoch Lochs Special Protection Area (SPA). The bridge carries the single carriageway A82 Trunk Road over the River Ba.

Figure 1.1 The western side of the existing Ba Bridge.

This scheme was formerly being developed by Jacobs Babtie on behalf of BEAR Scotland to undertake the due processes required by the 'Environmental Impact Assessment (Scotland) Regulations1999'. The scheme is now being developed and completed on behalf of Transport Scotland by Scotland TranServ who took over the North West Contract to maintain and upgrade the Trunk Roads in 2006. The Environmental Statement (ES) identifies the existing (baseline) environmental conditions and presents a variety of measures to prevent or reduce the predicted impacts. These are known as mitigation measures.

The Non-Technical Summary (NTS) is designed to provide an accessible summary of the ES and includes a brief description of the development proposals, the key potential environmental impacts and proposed mitigation measures.

1.2. Existing Bridge

Forming part of the A82, Ba Bridge is a three span bridge with parapets of coursed masonry, supported on masonry-faced concrete piers and abutments. It stands at a height of approximately 2.5 metres above the river level (Figure 1.1). An inspection concluded that the existing bridge structure was under strength and in need of repair to comply with British structural requirements for trunk roads.

2. Proposed Scheme Description

2.1. Scheme overview

The scheme proposal is to replace the existing Bridge with a design that is both stronger and wider. The new bridge will be placed on the existing alignment but it will be of a different design. The new bridge will cross the watercourse in three spans using the two existing intermediate piers as central supports. These shall be lowered by approximately 1 m. New reinforced concrete abutments shall be constructed behind the existing masonry abutments to minimise construction activity adjacent to the watercourse.

Throughout construction, traffic flow will be maintained on a temporary bridge, erected immediately to the west of the existing bridge. The temporary bridge will accommodate one lane of traffic that will be subject to appropriate traffic management to allow traffic flow in both directions. Upon completion the traffic will be moved onto the new structure, allowing the removal of the temporary bridge.

As the new deck is to be wider than the existing one 2.5 m high by 5 m long reinforced concrete retaining walls are to be provided at the bridge corners. It may be necessary to extend the works slightly beyond the existing footprint in order to accommodate the carriageway cross-section. Provision for pedestrians shall be made on the temporary bridge and maintained throughout the construction phase. On completion of the scheme peat turves removed in the area of the temporary bridge will be replaced and the area shall be reinstated to its existing condition using local provenance seed mixes.

2.2. Construction

2.2.1. Construction programme

The new bridge will be constructed by tendered contractors. It is anticipated that the construction works will be completed in stages as outlined in **Table 2.1**

Table 2.1 Key construction stages

Stage No.	Stage Description
1	Site compound establishment
2	Construction of substructure and foundations of temporary bridge
3	Construction and opening of temporary bridge
4	Removal of existing Ba Bridge
5	Construction of new bridge
6	Removal of temporary bridge

7	Landscape works
8	Removal of site compound

During construction, materials and the site compound will be located in a lay-by on the northbound carriageway, approximately 150 m north of the bridge and also at an informal lay-by directly opposite this on the southbound carriageway. The contractor will be permitted to work within normal construction hours from 0700 hours to 1900 hours during the summer months and may be less in winter, seven days a week for a period of 10-12 months. Night time working will be kept to a minimum in order to prevent disturbance to sensitive nocturnal species such as otter and bat. Throughout the construction works, mitigation measures will be put in place to ensure that impacts on the local environment are minimised.

2.2.2. Traffic management and access

Traffic management measures will be required during the construction period. A number of operations will require use of one-way traffic management and it is likely that this will be constant throughout the construction period.

Pedestrian access will be provided throughout the duration of the programme although there may be short periods when access is restricted and pedestrians may need to be escorted through the site.

2.2.3. Options appraisal

A report produced by Babtie in June 2002 ("Rannoch Moor/Glen Coe Assessment Review/Options Appraisal") considered the available options following a bridge failing to meet the BD21 Standards for Trunk Road bridges. These options were propping, strengthening, repair or closure. Propping is considered as a temporary measure in advance of strengthening, repair or replacement. The report compared and considered the advantages and disadvantages of various strengthening and replacement options. Subsequently, discussions with both BEAR and the Scottish Executive concluded that, on a value for money basis, the preferable solution was to replace the bridge. This is in recognition of the fact that, while there is an additional capital cost associated with the construction of a new structure, there are significant long-term benefits, including reduced maintenance costs.

The option presented in this ES was considered to be the preferred option, taking into account technical, economic, environmental and stakeholder considerations.

3. Environmental Impact Assessment (EIA)

3.1. Consultation

As part of the EIA process, a comprehensive consultation exercise was carried out with both statutory and non-statutory organisations. A total of 33 organisations were invited to comment and submit relevant information concerning the scheme and subsequent proposals. This exercise assisted in the identification of possible environmental impacts and the selection of appropriate study methods and mitigation measures, focussing on the most important, site specific environmental issues.

3.2. Scoping

All of the receptors with potential to be impacted as a result of the scheme were considered during the scoping stage of assessment. As a result of scoping some of these were "scoped out" from further assessment and are therefore not considered in this environmental statement. This process is summarised in **Error! Reference source not found.**.

Table 3.1 Summary of the issues scoped in and out

Issue	Scoping of Issue for Further Assessment	Reason for scoping in/out
Land use	OUT	No significant impacts to land use.
Geology and soils	IN	Small area of disturbance to substrate and geological resources.
Water quality and hydrogeology	IN	Bridge crosses a sensitive water course.
Ecology and nature conservation	IN	Surrounding area is of high natural heritage value.
Landscape	IN	New elements will be introduced to sensitive area.
Visual issues	IN	New elements will be introduced to sensitive area.
Cultural heritage	OUT	Unrecorded archaeological features are unlikely to be found on site because the area would have been heavily disturbed during the original construction of the A82 and Ba Bridge. This has been confirmed through consultation.
Air quality	OUT	The scheme will not result in a change in traffic conditions on the bridge during the operational phase, so no increase in air pollution is anticipated.
Traffic noise and vibration	OUT	The scheme will not result in a change in traffic conditions on the bridge during the operational phase, so no increase in noise or vibration is expected, thus no impact to the nearest receptor, which is five miles away.
Pedestrians, cyclists and community effects	OUT	The scheme will improve the situation for pedestrians and cyclists by the inclusion of a footway and wider

Issue	Scoping of Issue for Further Assessment	Reason for scoping in/out
		bridge.
Vehicle travellers	OUT	On-line bridge replacement.
Disruption due to Construction	IN	10 – 12 month construction in sensitive area.
Policies and Plans	IN	Slight impact.

3.3. Geology and Soils

Rannoch Moor is a flat low-level granite plateau overlain by glacial deposits and an extensive cover of blanket peat. Rannoch Moor is widely believed to be the centre of ice dispersal during the last maximum glaciation in the United Kingdom. Therefore, it exhibits important features of deglaciation and climate and landscape change. The extensive blanket peat acts as an important carbon store.

There will be no impact to the geological resource, but there will be a very slight loss of glacial deposits and peat from their original position as a result of the slight road widening and the new drainage channel. The peat will, however, be translocated to minimise its loss. There will be no change to geomorphological process rates, including those processes associated with the river.

3.4. Road Drainage and the Water Environment

Ba Bridge crosses the River Ba, which flows into Loch Ba immediately east of the bridge. This section of the river lies between Loch Ba and Lochan na Stainge and therefore has a fairly quiescent regime with little variability in flow level. The river is approximately 8 m wide and 0.75 m deep. The river is classified by the Scottish Environment Protection Agency (SEPA) as A2 or having 'good' water quality under their current rivers classification scheme. Under the loch classification scheme, Loch Ba has a water quality classification of 'excellent'.

There will be no change in the hydrological regime of the river during the operational phase of the scheme and there will be some improvement to the water quality through the implementation of a catch-pit and swale which will carry the run-off from the new bridge and adjacent carriageway to enter the River Ba downstream of the bridge. Currently the road drainage runs directly off the bridge into the river.

Full consultation with SEPA indicated that there were no issues with flooding. In addition, there are no properties within the area which could be considered at risk, the road is on raised embankments and attenuation is provided by the lochs at either end of the small section of river running underneath the bridge.

3.5. Ecology and Nature Conservation

Rannoch Moor is important for nature conservation. Ba Bridge lies within Rannoch Moor SSSI and SAC and immediately adjacent to Rannoch Lochs SPA. Rannoch Moor represents the most extensive complex of blanket bog and valley mire in Britain. It is of particular importance for its range of northern mire types. Rannoch Moor is the only remaining locality for a nationally rare vascular plant species and contains several other nationally and locally rare species. There are protected species located within the area around Ba Bridge, including black-throated divers (*Gavia arctica)* and a protected species of freshwater invertebrate. Neither of these species will be impacted providing appropriate mitigation is in place during the construction phase of the scheme. The River Ba also

contains Atlantic salmon (*Salmo salar*), one of the qualifying interests of the SAC. These and other aquatic fauna and flora will not be impacted from the operation of the scheme. Surveys of the area have indicated the presence of both otter (*Lutra lutra*) and bat species and therefore further surveys will require to be conducted prior to commencement of works to assess potential disturbance and mitigation measures which may need to be implemented.

There may be some direct habitat loss and loss of areas of vegetation and peat associated with the construction of the temporary bridge, widening of the embankments and excavation of the drainage ditch, although the majority of this impact will be minimised by adopting a programme of peatland translocation. There will be permanent loss of a number of small trees from the area immediately adjacent to the bridge.

During the operational phase, because the scheme is online, there will be no change in the impact to the ecological and nature conservation interests. However, environmental benefit will be achieved through the installation of an otter ledge which will provide a safe alternative to traversing the A82 There will be a need to monitor the peat translocation and habitat reinstatement to ensure that it is effective and that there is no long-term adverse effect to the local habitats.

3.6. Landscape Effects

Ba Bridge lies within the Ben Nevis and Glen Coe National Scenic Area and on one of Scotland's most important tourist routes. Landscape and visual issues associated with the scheme are therefore of particular importance.

Visitors to Rannoch Moor come to experience the spectacular landscape and enjoy the views of the moor, lochs and mountains. The proposals will not alter the wider moor, but changes to the bridge will alter the immediate landscape around the bridge. The new bridge will be similar in design to the existing one but constructed with different materials. It may initially seem out of context with the landscape, but will eventually become less noticeable as the structure weathers and visitors become accustomed to it. The contractor will be required to re-establish vegetation following construction, and as this matures the residual visual impact of the scheme will lessen.

3.7. Disruption Due to Construction

During construction of the scheme there will be some disturbance to the environment. Disturbance may include an increase in noise and vibration, construction dust, impacts on views, effects on water resources and delays or obstruction to vehicular and non-vehicular traffic. Most construction impacts will be short term; however, as discussed previously, there can be long-term impacts on ecology, geology and landscape. Short-term construction impacts have the potential to cause significant disturbance to the River Ba, local fauna and the surrounding vegetation. To ensure that these receptors are protected, various mitigation measures will be put in place including fencing off sensitive areas, installation of silt traps, avoidance of working within the watercourse, and putting protective matting in place. Techniques including stitch drilling and the use of a crash deck will also help to minimise potential impacts on the watercourse by helping prevent debris entering the watercourse.

The construction compound, material storage and machinery also have the potential to cause a number of impacts, such as the visual impacts of the works, temporary reduction in local air quality from dust, construction noise and temporary reduction of access for pedestrians. To mitigate these, the contractor will keep the site tidy by storing materials appropriately, minimising vehicle movements and adhering to best practice. An Ecological Clerk of Works may be employed at the site during times of sensitive operations to ensure that best practice and the proposed mitigation measures are adhered to.

Another significant impact is the traffic management measures that will need to be implemented. One lane will be closed throughout the construction period. To reduce this impact, the scheme will be well

publicised with appropriate signage to warn people of possible delays and traffic light sequences will be altered to accommodate peak times and flows.

3.8. Policies and Plans

The proposed development falls within the Highland Council area. Of relevance to the proposals is the approved Structure Plan and adopted Local Plan as well as various National Planning Policy Guidelines (NPPGs)/Scottish Planning Policies (SPPs).

The proposals are compatible with these planning guidelines and areas of minor conflict, relating mainly to temporary effects from construction are identified with relevant mitigation measures throughout the Environmental Statement.

3.9. Cumulative Impacts

With any bridge construction there may be cumulative impacts on landscape and visual receptors. The construction of Achnambeithach Bridge on the A82 further north in Glen Coe has been completed and there should be no other bridge construction projects carried out on the A82 between Bridge of Orchy and Glencoe at this time and so cumulative impacts are not expected. There are however at least a further 5 bridge replacement schemes proposed in the future for the Glencoe area.

3.10. Summary of Residual Impacts

Following the assessment of all potential impacts of the proposed development a range of mitigation measures have been identified. Implementation of these mitigation measures will reduce the majority of impacts to 'negligible' levels. However the following residual impacts will remain:

- Direct loss of some trees and scrub, heathland, peat and a small amount of glacial deposits;
- Inconvenience to travellers/tourists using the A82 during construction;
- Physical interruption/alteration of existing views to, along and across the existing A82 road and surrounding moorland;
- Impacts associated with the erection, operation and removal of site compound in lay-by and informal lay-by to the north of the bridge;
- Storage of materials, waste and site compound location during construction;
- Excavated and imported materials stockpiles causing temporary visual impact and loss of semi-natural vegetation during construction and
- Water quality improvement downstream of existing bridge brought about by enhancement of drainage and treatment of road run-off.

4. Review and Comments

Copies of the Environmental Statement are made available for inspection during normal office hours at:

The Scottish Government	**Fort William Library**	**The National Trust for Scotland Visitor Centre**
Enterprise, Transport and Lifelong Learning Department	Airds Crossing	Glencoe
Transport Scotland	High Street	Argyll
TS Trunk Roads Network Management	Fort William	PH49 4LA.
TS TRNM Bridges	Lochaber	
8th Floor	PH33 6EU; and	
Buchanan House		
58 Port Dundas Road		
Glasgow		
G4 0HF		

Copies of the Environmental Statement may be purchased (at a charge of £70 for a hard copy) and are also available in CD format (at a charge of £10), or download at www.transportscotland.gov.uk.

All hard copy requests should be made in writing to:

Alex Gardener

The Scottish Government

Enterprise, Transport and Lifelong Learning Department

Transport Scotland

TS Trunk Roads Network Management

TS TRNM Bridges

8th Floor

Buchanan House

58 Port Dundas Road

Glasgow

G4 0HF

The Non-Technical Summary is available free of charge from the same address and online.

Following the publication of the Environmental Statement, there will be a period of six weeks, during which representations may be made in writing to The Chief Road Engineer at the Scottish Government Enterprise, Transport and Lifelong Learning Department at the address above. The closing date for any such representations will be as specified in the Public Notice.

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GLOSSARY

Aggradation	To fill and raise the level of (the bed of a stream) by deposition of sediment.
Andesite	Fine-grained intermediate volcanic igneous rock. Mineralogically similar to the diorites.
Anthropogenic	Caused by human activities.
Arête	A fretted, steep-sided rock ridge separating u-shaped or cirque v alleys.
Bar	Generic term used to describe ridge-like accumulations of sediment within river channels. These develop on the bed of the river but may become exposed at low flow. Bar size is determined by sediment supply rate, with their height reflecting the depth of generating flows.
Boreal	Refers to a transitional period of time between the Younger Dryas stadial, characterised by glacial re-advances, and the Holocene interstadial (last 10,000 years). The Boreal climate was characterised by a snowy winter and warm summer, with a large annual range of temperature. It can also refer to the northern coniferous zone in temperate areas of the northern hemisphere.
Braiding	A braided river is a river whose flow passes through a number of interlaced branches that divide and rejoin.
Calcareous	Refers to substances containing or composed of calcium carbonate.
Carboniferous	i) Producing coal. ii) Of the Palaeozoic period, above Devonian and below Permian.
Chasmophytic	Vegetation growing in cracks and crevices.
Colluvium	A general term applied to any unconsolidated sediment deposited by rain-wash, sheet-wash, slope failure, or slow continuous down slope creep, usually collecting at the base of slopes or hillsides.
Competence	River flow competence is the maximum particle size which can be transported by the flow.
Corrie	A hollow, open downstream but bounded upstream by an arcuate, cliffed headwall, with a gently sloping floor or rock basin. They are common in formerly glaciated uplands.
Deltaic	Relating to, or like, a delta.
Desk Study	Assessment of a site usually preceding ground investigations typically incorporating a review of available site information, consultation with relevant bodies and a site visit.
Devonian	A geological period of the Palaeozoic era named after the county of Devon in south west England where Devonian rock outcrops are common. It extends from *c.* 416 to 350 mya.
Drift (Superficial) Deposits	Specifically glacial deposits but often used to include other natural superficial deposits such as alluvium and beach deposits. Superficial deposits: as Drift deposits, but includes anthropogenic deposits such as made ground.

Duty of Care	A duty placed on those with responsibility for controlled waste to ensure that it is managed properly and recovered or disposed of safely.
Dykes	Sheet–like bodies of igneous rock that cut across the bedding or layering of the host rock.
Entrainment	The mixing of materials or other air/liquids into a pre-existing organised air or liquid current so that the material or air/liquid becomes part of that current.
Ericoid	Of the sub-family *Erica* which grow in evergreen habit on the acidic, nutrient-poor substrates that support most heathlands.
Faults	A fracture or fracture zone along which there has been a displacement of rock.
Filamentous	A type of lichen characterised by a very fine, hair-like structure.
Flashy	Term used to describe the hydrograph of a stream which shows a rapid increase in discharge over a short period with a high peak in relation to normal flow.
Flow banding	The structure arising when directional movement of a liquid, containing crystals, causes these crystals to take up a parallel orientation.
Fluvial	Pertaining to flowing water. Produced by the action of a stream or river.
Geomorphology	The science of surface landforms and the processes that have created them.
Ground Investigation	Exploratory investigation to determine the structure and characteristics of the ground influenced by a development. The collected information is used to establish or predict ground and groundwater behaviour during, and subsequent to, construction.
Hanging Valley	A tributary valley whose floor is discordant with the floor of the main valley.
Holts	An underground burrow, sea cave or rock hole used by an otter.
Hydrophilous	Water loving species.
Igneous	Rock types originating from magma (underground lava).
Lithology	The macroscopic physical character of a rock or rock formation.
Macroinvertebrates	Animals without backbones that are big enough to see with the naked eye.
Magma	The molten rock material under the earth's crust, from which igneous rock is formed by cooling.
Mantle	The layer of the earth between the crust and the core.
Massive	The condition of a soil layer in which the layer appears as a coherent or solid mass.
Mesotrophic	Reservoirs and lakes which contain moderate quantities of nutrients and are moderately productive in terms of aquatic animal and plant life.
Microgranite	Rock with a mineralogical and chemical granite composition.

Montane	Pertaining to a mountainous region.
Oligotrophic	Reservoirs and lakes which are nutrient poor and contain little aquatic plant or animal life.
Paeleoenvironmental evidence	Study of environmental records such as pollen, foraminifera, micro fossils and sedimentology to determine environmental conditions and changes over time.
Planar	Lying in a plane. Completely flat.
Planform	The outline or shape of a body of water as determined by the stillwater line.
Pollution Prevention Guidelines (PPGs)	Each PPG, produced by the Scottish Environment Protection Agency, is targeted at a particular industrial sector or activity and aims to provide advice on statutory responsibilities and good environmental practice.
Porphyrite	Medium-grained rock. containing much larger individual crystals (phenocrysts) of any mineral.
Regionally Important Geological Sites	Sites designated by regional geological groups based on locally developed criteria, currently the most important places for geology and geomorphology outside statutorily protected land such as Sites of Special Scientific Interest (SSSI).
Rhyolite	Fine-grained to glassy acid volcanic rocks. Mineralogically similar to granites and microgranites.
Riffle	A shallow part of the stream where water flows swiftly over completely or partially submerged obstructions to produce surface agitation.
Riparian	Riparian zone is the interface between land and a flowing surface waterbody, characterised by hydrophilic plant communities.
Roche moutonnée	An asymmetric rock mound produced by glacial erosion, one side is ice moulded and smooth, and the other is ice-plucked and craggy.
Siliceous	Composed of silicon or primarily of silicon.
Sites of Special Scientific Interest	Areas of national importance. The aim behind the SSSI network is to maintain an adequate representation of all natural and semi-natural habitats and native species across Britain. The site network is protected under the provisions of Sections 28 and 19 of the Wildlife and Countryside Act 1981 as well as the Amendment Act 1985 and the Environmental Protection Act 1990.
Substrate	Material formed on, situated at, or occurring on the earth's surface, especially consisting of unconsolidated residual, alluvial, or glacial deposits lying on bedrock.
Water Framework Directive	The Directive was adopted by the European Parliament and the Council of the European Union on 22 December 2000. Its objective is to establish a framework for community action in the field of water quality to protect inland surface waters, marine, transitional waters and groundwater.

1. INTRODUCTION

1.1. Background information

The Scottish Government (Transport Scotland) is developing proposals to replace Ba Bridge in Rannoch Moor as it is under strength having been found to fail the minimum load carrying capacity for Trunk Roads. The bridge carries the single carriageway A82 Trunk Road over the River Ba. Scotland TranServ is developing the scheme on behalf of Transport Scotland. The scheme was formerly developed by BEAR Scotland, who commissioned Jacobs Babtie to undertake a full Environmental Impact Assessment (EIA) and produce an Environmental Statement (ES) for the proposals. The ES has been updated and reviewed to incorporate additional environmental work that has been undertaken by Scotland TranServ.

1.2. Site description

The bridge over the River Ba is located within Rannoch Moor Site of Special Scientific Interest (SSSI), Rannoch Moor Special Area of Conservation (SAC), Ben Nevis and Glen Coe National Scenic Area (NSA) and neighbours Rannoch Lochs Special Protection Area (SPA). The location of the bridge and the extent of the environmental interests within the study area are shown in Figures 1 and 3 within Appendix A.

1.3. Environmental Impact Assessment

The EIA of the proposed bridge replacement has been undertaken as an integral part of scheme design and appraisal, and follows the completion of an Environmental Scoping Report, which provided a brief description of the environmental impacts from all seven bridges in Glen Coe and Rannoch Moor, without detailed site specificity. The purpose of the assessment was to investigate the likely impact of the preferred route on the biological, physical, geomorphological and historical environment as well as on human welfare and current or future use of the environment. The environmental constraints have directly informed the design process and contract specification by incorporating measures to avoid, reduce, remedy or offset any predicted adverse environmental impacts.

1.4. The Environmental Statement

This Environmental Statement (ES) presents the results of the Stage 3 Scoping Report carried out in accordance with guidance from the Scottish Government on procedures as set out in the Design Manual for Roads and Bridges (DMRB) Volume 11 (1993 and subsequent amendments), and in compliance with Directive 85/337 EEC, as amended by Directive 97/11/EC, and applied by the Environmental Impact Assessment (Scotland) Regulations 1999 (as amended).

Accordingly, this ES sets out to provide:

- a description of the proposed scheme, comprising information on the site, design and scale of the project. This will include details of the land use requirements during construction and operation of the scheme as well as the nature, type and quantities of materials used;

- an outline of the main alternatives and the main reasons for the choice of the preferred scheme, taking into account environmental effects. Scheme alternatives were considered fully in the Jacobs Babtie report of 2002.

- a description of the aspects of the environment likely to be significantly affected by the proposed scheme;

- a description of the likely significant effects on the environment arising from the proposed scheme, its use of materials or its emissions. This will include direct, indirect, secondary, cumulative, short, medium and long-term, permanent, temporary, positive and negative effects and a description of the forecasting methods used to assess the impacts on the environment;

- a description of the measures envisaged to avoid, prevent, reduce and offset any significant adverse environmental impacts;

- an indication of any difficulties encountered in compiling the required information; and

- a non-technical summary of the information provided above.

The purpose of the ES is to identify the residual effects of the proposed scheme taking into account proposed mitigation measures in an objective, clear and comprehensive manner, so as to provide the Scottish Ministers, statutory and non-statutory bodies and the public with sufficient information to assess the impacts arising from the proposals in order for them to comment on its environmental impacts.

1.5. Structure of the Environmental Statement

The Environmental Statement (ES) presents the main report detailing the results of the EIA including figures (indicative) and appendices that offer supporting information to the EIA. The main section of the ES is presented in three sub-sections: Sub-section 1 contains an introduction, the need for the scheme, a summary of the alternatives considered, the key environmental issues and a detailed project description; Sub-section 2 contains the results of the scoping exercise undertaken with key statutory consultees together with the environmental assessment of the main topic areas; and Sub-section 3 summarises the main environmental impacts identified from the EIA process and the Schedule of Environmental Commitments agreed with the Scottish Government in tabular form.

A glossary of terms is provided immediately preceding Sub-section 1. Tables and Figures are interspersed throughout the text.

The Non-Technical Summary (NTS) highlights the key impacts and proposed mitigation measures in non-technical language and is bound into the front of Volume One of the Environmental Statement and is also available as a separate document.

Sub-section 1 – Introduction, project description and assessment of alternatives

Sub-section 1 comprises three chapters that provide the introduction and background to the scheme:

- Chapter 1 includes this introduction, which presents the purpose of the report, the assessment team and the report structure;

- Chapter 2 summarises the need for the scheme in terms of existing issues and the condition of the existing bridge;

- Chapter 3 describes the proposed scheme in terms of the details of the specimen design with proposed construction methods and programme.

Sub-section 2 – Environmental Impact Assessment

Sub-section 2 is divided into 10 chapters:

- Chapter 4 describes the approach adopted and the methods used during the assessment process;
- Chapter 5 reports the results of the consultation process undertaken during the preparation of this report;
- Chapters 6 to 11 each address a specific environmental topic area, with subsections on assessment methods, baseline conditions, predicted impacts, mitigation measures and residual impacts under the following chapter headings:
- Geology and Soils
- Road Drainage and the Water Environment
- Ecology and Nature Conservation
- Landscape Effects
- Disruption Due to Construction
- Policies and Plans

Sub-section 3 – Summary tables

Sub-section 3 presents the overall assessment summary:

- Chapter 12 provides a table of the environmental impacts associated with the project and summarises the significance of residual impacts with mitigation in place;
- Chapter 13 provides a summary of the mitigation and monitoring requirements that will be adopted during the construction and operation of the scheme including the objectives and mitigation methods.

1.6. Review and Comments

Copies of the Environmental Statement are made available for inspection during normal office hours at:

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Buchanan House		
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Glasgow		
G4 0HF		

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All hard copy requests should be made in writing to:

Alex Gardener

The Scottish Government

Enterprise, Transport and Lifelong Learning Department

Transport Scotland

TS Trunk Roads Network Management

TS TRNM Bridges

8th Floor

Buchanan House

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G4 0HF

The Non-Technical Summary is available free of charge from the same address and online.

Following the publication of the Environmental Statement, there will be a period of six weeks, during which representations may be made in writing to The Chief Road Engineer at the Scottish Government Enterprise, Transport and Lifelong Learning Department at the address above. The closing date for any such representations will be as specified in the Public Notice.

2. NEED FOR THE SCHEME

2.1. Introduction

Ba Bridge is a three span reinforced concrete beam and slab structure, supported on masonry-faced mass-concrete piers and abutments, with a height of approximately 2.5 m above river level. It has parapets of coursed masonry (Figure 2.1).

Figure 2.1 The western side of the existing Ba Bridge.

2.2. Existing condition of bridge

An inspection of the bridge structure, undertaken by Jacobs Babtie in 2002, as part of a regular biennial inspection, requested by the Scottish Executive, revealed that it failed to meet the statutory structural assessment to BD21, which is the technical standard giving the applied loading to be utilised for the assessment of road bridges. The structural requirement for trunk roads is an Assessment Live Loading (ALL) of 40 tonnes. Ba Bridge was assessed to have an ALL capacity of 7.5 tonnes.

This assessment concluded that the existing bridge structure was under strength and in need of repair to comply with British structural requirements for trunk roads. For a structure not to be signed with a weight limit it must be capable of supporting a 40 tonne ALL. New Trunk Road Bridges must be designed to carry full HA 40 Tonne loading and checked to 37.5 / 45 units of HB loading (150t/180t abnormal vehicle), according to BS5400 Part 2 Specification for Highway Loading.

2.3. Bridge replacement options

Jacobs Babtie (formerly Babtie Group) were commissioned by BEAR Scotland (NW Unit) to provide consultant services associated with the future management of seven under strength structures on the A82 Trunk Road between Bridge of Orchy and Glen Coe village. The options report identified that

there was no alternative to that chosen. A single span was at one point considered, but this was found to be unfeasible.

A report produced by Babtie in June 2002 ("Rannoch Moor/Glen Coe Assessment Review/Options Appraisal") considered the available courses of action required by BD21 in the event of a bridge structure falling below the 40 tonne ALL capacity. These are stated to be propping, strengthening, repair or closure. Propping is considered as a temporary measure in advance of strengthening, repair or replacement.

The report compared and considered the advantages and disadvantages of various strengthening and replacement options. Subsequently, discussions with both BEAR and the Scottish Executive concluded that on a value for money basis, the preferable solution for the structure was to provide a full bridge replacement. This is in recognition of the fact that, while there is an additional capital cost associated with the construction of a new structure, there are significant long-term benefits, including reduced maintenance costs. The reasoning for the current choice included the poor condition of the existing bridge, the difficulty in strengthening it and the aim to minimise future maintenance and environmental impact.

2.4. The environmental context

In 2002 while the Scottish Executive Development Department (SEDD) developed proposals for the replacement of seven bridges on the A82 (T) Road in the Rannoch Moor and Glen Coe area Jacobs Babtie was commissioned to undertake the environmental scoping for the seven bridges following the Scottish EIA guidelines for any construction work. The results of the study were reported in “A82 Rannoch Moor and Glen Coe Bridge Replacements – Environmental Scoping Study Final Report” (Babtie Group 2003). All seven bridges had failed to meet the desirable minimum load carrying capacity (40t) required for Trunk Road structures.

2.5. Conclusion

In April 2003 the Scoping Study was submitted to the Scottish Executive to inform the decision as to the level of further assessment required for the bridge replacements. In April 2003 the Scottish Executive confirmed that under the EIA (Scotland) Regulations 1999 a Stage 3 Environmental Statement would be necessary for the seven bridges.

3. SCHEME DESCRIPTION

3.1. Introduction

The bridge is to be constructed on Rannoch Moor (Figure 2.1), which is a large, broad and gently undulating plateau of moderate elevation supporting an extensive area of western blanket and soliginous/valley mire. The bridge spans the River Ba between Lochan na Stainge and Loch Ba within a SSSI, SAC and adjacent to an SPA that supports an internationally important breeding population of Black-Throated Divers. The site also supports other European protected species as well as lying within the Glen Coe and Ben Nevis NSA.

3.2. Scheme summary

The new bridge will be constructed on the same alignment occupied by the existing Ba Bridge. The bridge will be wider than at present to accommodate a 6 m carriageway, two 1 m wide hard strips and two 1.5 m wide verges. The new bridge will cross the watercourse in three spans using the two existing intermediate piers as central supports. The intermediate piers shall be taken down by approximately 1 m to facilitate a new approximately 400 mm deep pre-cast reinforced concrete capping beam, two free sliding pot bearings (per pier) and the new deeper deck. New reinforced concrete abutments shall be constructed behind the existing masonry abutments to minimise the construction activity adjacent to the watercourse. The existing abutments shall be taken down by approximately 1.25 m and hence shall not be connected to the bridge deck. The wing walls are to be shaped to suit the 1.25 m cut-down abutment and the wider deck.

During construction, traffic flow will be maintained throughout on a temporary bridge, situated within the existing embankment footprint as much as is practically possible, however, it may be necessary to extend the works slightly beyond the existing footprint in order the accommodate the carriageway cross-section.. The traffic is to be moved to the temporary bridge to allow the demolition of the deck. The new deck, pier tops and abutments are to be constructed as shown in Figure 2 (Appendix A) and upon completion the traffic is to be moved onto the new structure, allowing the removal of the temporary bridge and the construction of the remaining portion of deck and abutments. During all stages of demolition and construction, a crash deck or similar structure shall be in place to protect the watercourse from any construction debris.

Since the new deck is to be wider than the existing deck, small approximately 2.5 m high, 5 m long reinforced concrete retaining walls are to be provided at the four bridge corner tie-ins.

Provision will be made for pedestrians on the temporary bridge and maintained throughout the construction phase. (Figure 2, Appendix A).

During construction, the Contractor's offices may be located in a lay-by on the northbound carriageway, approximately 150 m north of the bridge and at the informal lay-by opposite this on the southbound carriageway. The site extents should mostly be within the existing embankment footprint so as to minimise the overall area of peatland to be impacted, however, it may be necessary to extend the works slightly beyond the existing footprint in order the accommodate the carriageway cross-section.. The temporary bridge alignment will be located immediately west of the existing bridge (Figure 1, Appendix A).

On completion of the scheme the area shall be landscaped using seed mix of local provenance to reinstate it, as near as possible, to its existing condition. Peatland turves removed and stored during construction will also be reinstated. There is an area adjacent to the southbound carriageway opposite the existing lay-by which contains much old road debris. It is proposed that this area will be made into a formal lay-by and landscaped sympathetically as part of an additional scheme and is not considered further within this ES.

3.3. Bridge specification

3.3.1. Bridge

The new bridge will cross the watercourse in three spans of approximately 11.5 m, 8.5 m and 11.5 m, spanning from the new abutments (behind the existing) onto modified existing intermediate piers. The skew angle of the existing and new bridge is 0 degrees. The bridge deck shall comprise a reinforced concrete slab deck on 6 longitudinal 'weathering steel' girders with identical transverse girders provided at each of the four supports. The weathering steel is designed so that in its early service life a protective patina of oxidation ('rust') forms on its surface and thereby provides corrosion protection to the girders. This obviates painting of the steel. The patina develops over a number of months and gives the appearance of a slightly textured typically deep brown/purplish colour that is intended to visually blend with the environment. The soffit of the girders shall be at a level of approximately 2.5 m above water level. The construction sequence for the bridge is detailed in Table 3.1.

Table 3.1 Anticipated Key Construction Sequence

Stage	Anticipated Key Construction Sequence
1	Establish site compound
2	Place sediment traps and matting on the edges of the water course and then temporarily remove peat from areas where temporary bridge foundations will be laid.
3	Construct foundations ensuring minimal disturbance to neighbouring habitats, place the temporary bridge ensuring no in-stream working and divert traffic to temporary bridge.
4	Demolish existing structure. Part demolish intermediate piers to level to accept new capping beams. Part demolish abutments to level necessary to provide adequate clearance to permanent superstructure. Demolition is to be carried out using controlled methods and adherence to environmental restrictions, including no in-stream working, provision of a catch deck and netting to catch debris.
5	Behind existing abutments, excavate to formation level, removing any loose or fractured rock head ensuring that material does not enter the watercourse or smother surrounding vegetation.
6	Cast blinding for new abutment pier foundations.
7	Install pre-cast pier-capping beams and cast abutment foundation bases and columns. Cast plunge columns into position to top of abutment piers.
8	Erect steel framework adjacent to the works away from the watercourse, because full penetration butt welding is required and ground-level working is most beneficial.
9	Backfill and compact behind existing abutments/wing walls until formation level for wing walls is reached, ensuring no material enters the l watercourse.
10	Crane entire steel framework into position ensuring that no material enters the watercourse.
11	Cast *in situ* reinforced concrete end diaphragms.
12	Cast remaining *in situ* reinforced deck elements.
13	Cast blinding layer for wing walls and cast *in situ* reinforced concrete wing walls.
14	Conclude backfilling operations.
15	Install pre-cast parapets and complete carriageway/bridge.

Stage	Anticipated Key Construction Sequence
16	Remove temporary bridge and reinstate peat in areas of temporary bridge foundations
17	Complete landscaping, replacement of peat and reseeding where required.
18	Remove site compound and clean site-compound area.

3.3.2. Parapets

The aim of the parapet provision is to provide similar parapets on all the bridges being replaced in Rannoch Moor and Glencoe. The parapets on Ba Bridge shall be the same as that provided on the south side of Lairig Eilde Bridge. The parapet comprises a part height concrete barrier with single top tubular rail.

3.3.3. Drainage

The existing bridge drains via down pipes directly into the watercourse. In the new scheme a combined kerb and drainage system will be provided. Ba Bridge and the northern tie-in section drains to kerb drainage units across the bridge which outfall at the south end of the bridge into 2 catch pits through 225mm diameter pipes. The tie-in to the south is kerbed for a length of approximately 30m with kerb drain units at the southern extent to catch run-off. These discharge to the 2 catch pits through 225mm pipes. The catch pits are 1050mm diameter with a 300mm sump. The 2 catch pits discharge through a masonry or precast headwall to a grass swale, 450mm (base width) x 300mm (depth), which follows the existing ground slope at approximately 1:250. This then discharges to the River Ba.

3.3.4. Footways

1.5 m footways are to be provided at each side of the new bridge. These are to be of the same construction as at Lairig Eilde bridge and shall meet the widened verges at the bridge extents.

3.4. Road improvements

The replacement bridge is on the same alignment as the existing. There will be some minor road improvements required north and south of the bridge to accomplish the increased carriageway width at the bridge and subsequent tie in.

3.5. Construction

The construction period required for the entire scheme will be in the region of 10 - 12 months. It is anticipated that the contractor shall work normal construction hours, which will be from 0700 hours to 1900 hours during summer months and may be less in winter, seven days a week. Night time working will be kept to a minimum in order to prevent disturbance to sensitive nocturnal species such as otter and bat.

3.6. Significant and disruptive works stages

3.6.1. Traffic management

It is likely that one-way traffic management will be continuous throughout the construction period.

- In addition to normal construction works, disruption for site access and transport of materials

is anticipated.

3.6.2. Temporary bridge

Following a survey of a protected species of freshwater invertebrate by the Scotland TranServ Environment Team during summer 2008 (confidential Appendix D), it was advised that the temporary bridge should ideally be located on the eastern, downstream side of the existing bridge to minimise the impacts on the species which are prevalent on the upstream, western side. However, ground conditions on the eastern side of the bridge were deemed unsuitable. Instead the temporary bridge will have to be sited on the upstream, western side of the existing bridge. It will be placed as close as possible to the existing bridge in order to minimise potential disruption to the protected freshwater invertebrate species. Ideally the drainage should be collected from the temporary bridge to maintain water quality, however, due to the nature of the construction of the temporary bridge this has been deemed unfeasible by the scheme designer, The temporary bridge will however be raised in relation to the existing road, therefore run-off entering the watercourse will be minimized to that coming from the bridge itself and not from the road.

In order to construct the temporary bridge without temporary closure of the A82, the main span of the bridge must be constructed on-site, adjacent to and level with its final location so that it can be pushed into place. In order to achieve this, temporary trestle structures are required on either side of the main span. The temporary trestle structures shall require adequate foundations. A crane hard standing area is required on both sides of the bridge to assist in the launch of the main span. Once the main span of the temporary bridge is in position, the temporary trestle structures are to be dismantled and the approaches are to be constructed. The approaches and temporary bridge itself require adequate foundation arrangements.

The foundations for the temporary bridge are expected to be precast mass concrete blocks but there may be additional gabions and fill. Granular fill may be required in the base of the foundations to provide a level surface for the precast blocks. It is proposed that the peat at the foundation locations is carefully excavated and stored for later replacement. The precast mass concrete foundations shall be craned into the excavations and shall bear directly onto the underlying bedrock, approximately 2.5 m below the existing ground level. Upon removal of the temporary bridge, the foundations are to be taken out of the excavations and the peat is to be restored and landscaped as far as possible to its existing condition.

3.6.3. Bridge demolition

The demolition of the existing Ba Bridge is a two-stage, controlled process. Prior to any demolition work, a suitable crash deck or similar structure shall be provided in the adjacent area to protect the watercourse from falling debris and other waste arising. In order to minimise dust and debris, the existing bridge deck shall be removed by the formation of a number of fragments formed by stitch drilling/coring from above with dust removal by vacuum.

3.6.4. Bridge construction

The bridge specification has been provided in section 3.3. The abutments and retaining walls are to be formed *in situ* from vehicle-delivered, ready-mixed concrete. The deck is formed by placing the prefabricated longitudinal and transverse girders onto the abutments and intermediate support bearings. Permanent corrugated glass reinforced plastic (GRP) formwork spans between the longitudinal girders and forms the support for the concrete deck slab. The edge sections of the deck,

which cantilever away from the outermost longitudinal girders (and are thus unsupported by any permanent formwork), shall be formed using contractor designed methods. No such construction activity is to take place without the appropriate crash deck or similar structure provision.

The new bridge construction will incorporate the following mitigation measures:

- In-river working will be restricted to the immediate vicinity of the existing bridge with no machinery access at this point. In-river working upstream of the bridge will not be permitted in order to safeguard the population of protected freshwater invertebrate species.

- Measures will be taken to prevent sediment run-off in surface water and prevent sediment entering the watercourse. Measures include the use of temporary sheeting over exposed materials, including soils and use of silt traps. The requirements for such measures shall be incorporated into the specification for the works.

- Measures will be taken to ensure that *in situ* concrete is placed accurately within a sealed off area ensuring that concrete pumps, including their wash-down, do not discharge into the river. Preventative measures will include temporary scaffolding screens.

- The design of the bridge incorporates stainless steel reinforcements. The use of stainless steel is preferential to high-yield steel (used on most bridges) as it eliminates the need for hydrophobic pore lining impregnates (silane or siloxane). These impregnates are normally used to prevent reinforcing bars in the concrete corroding over time but are toxic in their liquid form during placement and require re-application at approximate 20 year intervals; and

- The bridge deck has been made integral with its abutments to prevent the requirement for bearings at these locations thus reducing the requirement for future maintenance and hence access to underneath the bridge. The bearings on the intermediate piers are unavoidable and shall be specified as stainless steel to provide additional durability, thus reducing the maintenance requirements.

3.6.5. Imported materials

- Concrete: estimated at 215m^3 ready mixed structural concrete plus an additional 60m^3 for concrete kerb haunching;

- Reinforcement: 68.5 tonnes of stainless steel and stainless-steel products;

- Weathering steel: 53 tonnes, prefabricated bridge girders;

- Road construction materials (excluding that required for temporary diversion works) – approximately 350 tonnes including Type 1 granular material, bituminous bound and asphaltic materials;

- Structural fill material: approximately 550m^3, 1500 tonnes. This may vary depending on ground conditions;

- Waterproofing material: bridge deck waterproofing to cover approximately 390m^2, bituminous and waterproofing paint to cover approximately 210m^2;

- Other materials include: 90m length of metallic components for parapets, 120m of safety fences, clay drainage pipe products, 200m of uPVC ducting in the bridge, approximately 25m^2 drainage composite fabrics for retaining walls;

- Miscellaneous small part materials, such as nails, screws, scaffolding, plywood and polythene sheeting, quantities unknown; and

- Additional materials, quantities unknown, will be brought in by the Contractor for the temporary works.

3.6.6. Material storage

The restrictive site boundary means that storage space is limited on site. It is anticipated that the contractor shall adopt a logistical plan utilising the 'Just in Time' delivery system, which involves bringing materials to site as they are required rather than unnecessarily storing material on site, thus reducing the requirement for storage space. Where the requirement for space is unavoidable, it may be necessary for the contractor to use the non-trafficked area of the road together with a built-up area of the embankment. The contractor shall not be allowed to store bulk material directly on the peatland. However, if this is unavoidable, advice will be sought from Scotland TranServ Environment Team.

3.6.7. Waste

Different wastes will be handled by the following means:

- All waterborne waste will be intercepted and contained before reaching watercourses or groundwater;

- Airborne particles will be extracted by vacuum where appropriate e.g. drilling dust;

- All other waste will be disposed of by a licensed contractor; and

- There will be no waste disposal on site.

3.6.8. On-site welfare provision

The site compound and lavatories are expected to be located within the confines of the site compound. Waste water will removed from site by tanker. Fresh water will be stored in tanks.

3.7. Assumptions and uncertainties

It is not possible to know the number of construction staff, vehicles and plant that will be on site as the construction will be carried out by a contractor who will have their own approach to addressing the construction and mitigation measures set out in this report. However, based on numbers of construction staff at the nearby Achnambeithach Bridge, a rough estimate would be between 6 and 20 staff at any one time depending on the specific operation. It is also not possible at this stage to determine the extent and location of temporary and permanent signage at the site.

4. STUDY METHODS

4.1. Introduction

The aims of the environmental impact assessment are:

- to gather information about the environment of the study area and identify environmental constraints and opportunities associated with the area which may influence, or be affected by the proposed scheme;
- to identify and assess predicted environmental impacts; and
- to identify and incorporate into scheme design and operation, features and measures to avoid or mitigate adverse impacts and enhance beneficial impacts.

This chapter discusses the approach and methods used to carry out the assessment and identifies aspects of the proposed development that have been subject to assessment.

4.2. Approach and methods

4.2.1. Scope and guidance

This EIA has been carried out in accordance with the Design Manual for Roads and Bridges (DMRB), first published in 1993 and subsequently amended and updated by the Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland. DMRB is the Government Advice Note that provides guidance on the development of trunk road schemes including motorways and is applicable to this scheme. Within the DMRB Volume 11 specifically provides guidance on the environmental impact assessment of this type of scheme, including the level of assessment required at key stages of development and the requirements for reporting the environmental effects of the scheme.

The DMRB specifies three key levels of assessment to be undertaken, defined as Stage 1, Stage 2 and Stage 3. The objectives of each Stage are identified in Table 4.1.

Table 4.1 Stages of EIA according to DMRB, Volume 11

Stage	Objectives
Stage 1	Identification of environmental advantages, disadvantages and constraints associated with broadly defined route corridors.
Stage 2	Identification of the factors and effects to be taken into account in the selection of route options and in the identification of the environmental advantages, disadvantages and constraints associated with these routes.
Stage 3	Assessment to be undertaken in accordance with the requirements of Sections 20A and 55A of the Roads (Scotland) Act 1984 and EIA (Scotland) Regulations 1999 (as amended) which implements EC Directive 85/337, with publication of an Environmental Statement or Environmental Assessment Report.

The assessment of the route options for the Ba Bridge in Glen Coe at Stages 1 and 2 were progressed as part of the studies undertaken in 2002, as referred to in Chapter 2, section 2.2.3.

The assessment covered in this report comprises a Stage 3 assessment, undertaken between December 2005 and July 2008. It comprises a detailed assessment identifying the likely impacts of the proposed scheme and the associated mitigation measures. It builds upon and supplements the work of the previous Stage 1 Scoping Report (Rannoch Moor/Glencoe bridge replacements, 2003).

The assessment for Stage 3 has been carried out as an integral and iterative part of the scheme design and the issues arising from this process have informed decisions in the development and design of the scheme. The process undertaken for the design of the proposed alignment is discussed in more detail in Chapter 2.

Although this Stage 3 assessment has been carried out in accordance with the DMRB, Volume 11, it has been supplemented by further guidance including that detailed in Table 4.2.

Table 4.2 Best practice guidance used for environmental assessment

Environmental assessment area	Best practice guidance used
General	• *Environmental Impact Assessment (Scotland) Regulations* 1999 • PAN58 *Environmental Impact Assessment*, Scottish Executive 1999 • Circular 15/99 *The Environmental Impact Assessment (Scotland) Regulations 1999*, The Scottish Executive • *A Handbook on Environmental Impact Assessment – Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland*, SNH 2002
Surface Water Quality	• *Sustainable Urban Drainage Systems: Design Manual for Scotland and Northern Ireland*, CIRIA 2000 • *PPG1: General Guide to the Prevention of Pollution,* SEPA, • *PPG2: Above Ground Oil Storage Tanks,* SEPA 2004. • *PPG5: Works and Maintenance in or near Water,* SEPA 2007. • *PPG6: Working at Construction and Demolition Sites,* SEPA. • *PPG10: Highway Depots,* SEPA. • *PPG13: Vehicle Washing and Cleaning,* SEPA, 2007. • *PPG22: Dealing with Spillages on Highways,* SEPA. • *PPG23: Maintenance of Structures replaced by PPG5,* SEPA, 2007. • *PPG26: Storage and handling of drums and intermediate bulk containers (IBCs),* SEPA 2004. • *The Water Environment (Controlled Activities) (Scotland) Regulations 2005,* SEPA • *SPP7: Planning and Flooding,* Scottish Executive, 2004 • *PAN 79: Water and Drainage,* Scottish Executive, 2006.
Ecology and Nature	• *Guidelines for Baseline Ecological Assessment,* The Institute of

Environmental assessment area	Best practice guidance used
Conservation	Environmental Assessment (IEA) 1995 • *Guidelines for Ecological Impact Assessment in the UK*, The Institute of Ecology and Environmental Management, (IEEM) 2006 • *Ecological Impact Assessment*, Jo Treweek 1999 • *Biodiversity Impact* , Helen Byron 2000 • *National Planning Policy Guideline (NPPG)14, Natural Heritage, 1999* Scottish Office Development Department
Landscape & Visual Issues	• *Landscape and Visual Assessment Supplementary Guidance*, Scottish Executive 2002 • *Cost Effective Landscape: Learning from Nature*, Scottish Executive, 1998 • *Guidelines for Landscape and Visual Assessment,* Institute of Environmental Management and Assessment, 2002 • *PAN 58, Environmental Impact Assessment, Scottish Executive, 1999* • *Lochaber Landscape Character Assessment*
Cultural Heritage	• NPPG5 *Archaeology and Planning*, The Scottish Office Environment Department1994 • *Planning Advice Note 42: Archaeology – the Planning Process and Scheduled Monument Procedures*, The Scottish Office Environment Department, 1994 • *SPP 18: Planning and the Historic Environment.* Scottish Executive, *2005.*
Air Quality	• *The Environment Act* 1995, Part IV • *The Air Quality (Scotland) Regulations*, The Stationery Office, 2000 • *The Air Quality (Scotland) Amendment Regulations*, The Stationery Office, 2002
Traffic Noise and Vibration	• *The Noise Insulation (Scotland) Regulations*, 1975 • *Memorandum on the Noise Insulation (Scotland) Regulations,* 1975 • *Calculation of Road Traffic Noise (CTRN),* Department of the Environment, 1988
Policies and Plans	• *SPP1: The Planning System*, The Scottish Executive Development Department (November 2002) • *NPPG5: Archaeology and Planning*, The Scottish Office Development Department, 1994 • *NPPG 10: Planning and Waste Management* • *NPPG11: Sport, Physical Recreation and Open Space*, The

Environmental assessment area	Best practice guidance used
	Scottish Office Development Department, 1996 • *NPPG14: Natural Heritage*, The Scottish Office Development Department, 1999 • *NPPG15: Rural Development*, The Scottish Office Development Department, 1999 • *NPPG 17: Transport and Planning, The Scottish Office Development Department, 1999?* • *NPPG18: Planning and the Historic Environment*, The Scottish Office Development Department, 1999

In accordance with DMRB Volume 11, assessment has been undertaken for the following environmental factors:

- Land Use;
- Geology and Soils;
- Road Drainage and the Water Environment;
- Ecology and Nature Conservation;
- Landscape;
- Visual Issues;
- Cultural Heritage;
- Landscape Effects;
- Disruption Due to Construction; and
- Policies and Plans.

4.2.2. Assessment methods

Impacts which occur during construction works but are either long term or permanent (and will therefore persist once the scheme is operational) are considered in the Chapters 7 – 11 of this ES, under the relevant headings such as Ecology and Nature Conservation.

Other impacts that are temporary and occur either prior to construction (e.g. assembly of temporary bridge) or during construction of the new bridge are considered separately in Chapter 10 – Disruption Due to Construction. However, there may be some overlap between construction and operational impacts and in these cases the impacts are generally described in the main operational chapter.

The assessment of impacts has followed the overall process outlined below for all subjects. However, individual sections may have used a slightly different layout appropriate to the assessment:

- identification of baseline conditions of the site and its environs;

- consideration of potential causes of impact;
- assessment of the significance of impact, taking into account sensitivity of resources and magnitude of impact;
- identification of mitigation measures; and
- assessment of significance of residual impacts taking account of any mitigation measures.

Further discussion of baseline conditions, predicted impacts, mitigation and the definition of residual impacts is provided below.

4.2.3. Baseline conditions

The specific assessment for each environmental subject has been undertaken in relation to a 'baseline'. The 'baseline' normally reflects the existing situation and how this would change if the scheme did not go ahead (i.e., the Do Nothing Scenario).

Baseline information has been collected through site visits, and review of maps, data, records, information and reports obtained from statutory and non-statutory organisations and a variety of field surveys. The consultation process with statutory and non-statutory organisations is reported in Chapter 5.

4.2.4. Predicted impacts

The nature of predicted impacts arising from the scheme has been described and an assessment of the level of significance of the impact (negligible, slight, moderate or major) for each effect determined as far as practical.

There is no universally accepted definition of what constitutes a significant impact. The question of significance varies according to the environmental factor under consideration, the context in which the assessment is made and the background of the assessor. Much depends on the availability of data relating to existing environmental conditions and the value applied to these conditions. However, in general, the level of significance of impact has been defined using a combination of the sensitivity (high, medium and low), of the environmental feature in question, and the magnitude of impact (major, moderate, minor and negligible), each having been assessed independently according to defined criteria. Sensitivity has generally been defined according to the relative importance of the feature, i.e. whether it is of national, regional or local importance or by the characteristics of the receptor. In the definition of magnitude of impact, consideration has been given to any legislative or policy standards or guidelines, and/or the following factors:

- the degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- the scale of the development, e.g. the size of land area or number of people affected and degree of change from the existing situation;
- the scale of change resulting from impacts; and
- whether the effect is temporary or permanent.

Impacts may also be wide-ranging in nature, for example, they could result in direct or indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, positive or adverse effects. These factors have also been taken into account.

4.2.5. Mitigation measures

The approach to mitigation measures adopted for this EIA is consistent with the guidance provided in Planning Advice Note 58 on EIA that considers mitigation as a hierarchy of measures ranging from prevention of environmental effects by avoidance, down to compensatory measures for effects that cannot be remedied. The mitigation hierarchy is summarised in Table 4.3.

Table 4.3 Mitigation hierarchy

Level of Mitigation	Definition
Prevent	To prevent adverse environmental effects at source, for example, through choice of site or specification of construction equipment.
Reduce	If adverse effects cannot be prevented, steps taken to reduce them through such methods as minimisation of cause of impact at source, abatement on site and abatement at receptor.
Remedy/offset	When effects remain that cannot be prevented or reduced, they are offset by such remedial or compensatory action as provision of environmental improvements, opportunities for access and informal recreation, creation of alternative habitats and prior excavation of archaeological features.

The approach to the mitigation of adverse environmental impacts has been to avoid them wherever possible. This has been achieved by consideration of ways in which to prevent adverse effects at source, rather than relying on measures to mitigate the effects. For the Ba Bridge, this has been undertaken throughout the design phase

Where avoidance of impacts has not been assessed to be feasible, measures have been proposed to minimise potential impacts through abatement methods at the site (for example, by the use of landscaping and sediment trapping techniques).

4.2.6. The definition of residual effects

Residual effects are those that cannot be mitigated against and last well into the operational phase of the scheme, such as permanent loss of woodland. The assessment of residual effects takes into account mitigation measures to be adopted as specified in this report. Within the assessment of residual effects, the level of significance for each effect is determined as far as practicable as defined above under Predicted Impacts.

5. CONSULTATION

5.1. Introduction

This chapter describes the consultation process that was undertaken throughout the various stages of the EIA process and provides a summary of the key issues raised by consultees. It also includes relevant responses from consultations that were undertaken as part of the Stage 1 Scoping Report. Consultation is a key and fundamental part of the EIA process.

5.2. The consultation process

The consultation process serves to:

- ensure that statutory consultees and other bodies with a particular interest in the environment within the area of the scheme are informed of the proposal and provided with an opportunity to comment;
- obtain baseline information regarding existing environmental site conditions;
- establish key environmental issues and identify potential impacts to be considered during the EIA;
- identify those issues which are likely to require more detailed study and those which can be justifiably excluded from further assessment; and
- provide a means of identifying the most appropriate methods of impact assessment.

Although consultation is an important part of the EIA process, it may continue in an iterative manner throughout the detailed planning and design stages of the project.

All consultees were contacted by letter, originally by Jacobs Babtie in 2003, informing them of the details of the proposed development and requesting that they provide any specific baseline information that they may hold or any comments they may have concerning the proposed scheme. The information requested was tailored specifically for each consultee and was based on the consultations undertaken at the previous stages of assessment. A plan of the proposed bridge replacement designs and realignment accompanied the letter. A further consultation was conducted by Scotland TranServ in November 2006 to determine if any new environmental issues had developed since the initial consultations by Jacobs Babtie.

5.3. List of consultees

Consultations were undertaken with the statutory and non-statutory bodies detailed in Table 5.1.

Table 5.1 Organisations, businesses and people consulted.

Consultee	Contacted by Jacobs Babtie	Contacted by Scotland TranServ
Argyll and Bute Council	X	
Ballachulish Community Council	X	X

Consultee	Contacted by Jacobs Babtie	Contacted by Scotland TranServ
Bridge of Orchy	X	
Freight Transport Association		X
Glencoe Cottages	X	
Glencoe and Glen Etive Community Council	X	
Health and Safety Executive	X	
Historic Scotland	X	X
Highland Council *	X	X
Highlands and Islands Fire Brigade		X
Highlands of Scotland Tourist Board	X	
Lochaber Mountain Access Group	X	X
Mountaineering Council of Scotland	X	X
National Trust for Scotland	X	X
Nevis Range Development Company	X	X
Paths for all Partnership		X
Police		X
Road Haulage Association		X
Ramblers Association		X
Royal Society for the Protection of Birds	X	X
Scottish Ambulance Service		X
Scottish Canoe Association	X	
Scottish Environment Protection Agency	X	X
Scottish Executive Environment and Rural Affairs Department	X	X
Scottish Natural Heritage	X	X
Scottish Ornithologists' Club		X
Scottish Water	X	
Scottish Wildlife Trust	X	X
Scottish Youth Hostel Association	X	
Scotways		X
SUSTRANS		X

Consultee	Contacted by Jacobs Babtie	Contacted by Scotland TranServ
Tay District Salmon Fisheries Board		X

* More than one division/group was consulted within the organisation.

5.4. Key issues raised by consultees

The key issues raised by individual consultees are identified in Table 5.2. The issues are categorised under the relevant ES chapter, where appropriate. The following consultees either had no comment or did not respond to the consultation: Road Haulage Association, Ramblers Association, Police, Scottish Ornithological Club, Scotways, Tay District Salmon Fisheries Board, SUSTRANS, Freight Transport Association, Highlands and Islands Fire Brigade, Scottish Ambulance Service, Argyll and Bute Council, Bridge of Orchy, Glencoe Cottages, Glencoe and Glen Etive Community Council, Scottish Canoe Association and Scottish Wildlife Trust.

5.5. Analysis of key issues

The main environmental issues arising from the consultation exercise are summarised below and are sub-divided according to the relevant chapter headings of the ES. Due to the format of the scoping report, the majority of consultation feedback from the Jacobs Babtie Consultation is general and refers to all seven bridge replacement schemes, so some issues were not directly relevant to Ba Bridge.

5.5.1. Land use

Health and Safety Executive

- Confirmed that there are no major hazard sites, pipelines or explosive sites listed in their records within the vicinity of the proposals. Hazardous installations have therefore been scoped out.

5.5.2. Geology and Soils

Highland Council

- There are no details of known or potentially contaminated land in the vicinity of the proposals within the Highland Council area. Contaminated land has therefore been scoped out.

5.5.3. Road drainage and the water environment

Scottish Environment Protection Agency (SEPA)

- Advised that water quality status must be maintained; erosion, sedimentation and discolouration prevention measures are implemented. Schemes should be designed to avoid crossing watercourses, and to bridge watercourses which cannot be avoided.

Scottish Water

- Confirm that no schemes affect Scottish Water's services.

5.5.4. Ecology and nature conservation

SNH

- Concern of potential impact on the protected species of freshwater invertebrate as a result of sedimentation arising from in-river construction works.

Highland Council

- The study should include a detailed assessment of ecological areas and habitats, an evaluation of impact of the works on these sites or habitats mitigation measures to address areas of concern identified and reinstatement measures relative to all areas of disturbance.

National Trust for Scotland

- NTS would like to see, a strict commitment to removing, storing and replacing turves *in situ*.
- In any restoration works, only species native to the glen should be used in seed mixes.

RSPB

- A pair of black Throated Divers attempt to nest by Loch Ba most years but usually fail due to disturbance from fishermen. Any work at the bridge should be carried out in such a way as to avoid pollution to the loch and, if possible, done outwith the period May to July, inclusive, to minimise disturbance. The response from the RSPB in November 2006 stated, however, that they were unaware of any bird species of particular conservation concern.

SEPA

- SEPA request that habitat and species surveys are carried out at appropriate times of the year by appropriately qualified and experienced personnel, and suitability of timing needs to be considered within the ES.

Table 5.2 Scoping matrix of key consultee issues with the 2006 responses having credence over earlier responses.

Consultee	Land Use	Geology / Soils	Hydrodynamics, water quality	Ecology & Nature Conservation	Landscape and visual	Cultural Heritage	Air Quality **	Traffic Noise & Vibration **	Pedestrians, Others & Community	Vehicle Travellers	Disruption due to Construction	Polices and Plans
Ballachulish Community Council					•					•	•	
Health and Safety Executive	•										•	
Highland Council*		•		•	•	•			•	•		•
Highlands of Scotland Tourist Board											•	
Lochaber Mountain Access Group											•	
Mountaineering Council of Scotland					•				•		•	
National Trust for Scotland*			•	•	•	•			•	•	•	
Nevis Range Development Company											•	
Paths for All Partnership									•			
Royal Society for the Protection of Birds				•							•	
Scottish Environment Protection Agency			•	•							•	
Scottish Executive Development Department			•									•

Consultee	Land Use	Geology / Soils	Hydrodynamics, water quality	Ecology & Nature Conservation	Landscape and visual	Cultural Heritage	Air Quality **	Traffic Noise & Vibration **	Pedestrians, Others & Community	Vehicle Travellers	Disruption due to Construction	Policies and Plans
Scottish Natural Heritage*				•	•						•	
Scottish Water			•									

** No issues raised, therefore scoped out.

5.5.5. Landscape and visual issues

SNH

- Key viewpoints should be agreed with SNH and photos of the existing landscape, together with visualisations of the proposed development, produced for each viewpoint. Viewpoints should be identified relevant to road users, walkers and climbers. Consideration should be given to changeable light levels, both by day and seasonally. A plan showing the zone of visual influence is also recommended;

- Reference should be made to the NSA description, SNH's Landscape Character Assessment for Lochaber, SNH's Policy Statement on Wildness in Scotland's Countryside and the Glencoe and Rannoch Moor Landscape Study (Cobham Resource Consultants 1991);

- Request that details of the following are provided:

- design and materials of the bridges and any associated structures – both temporary and permanent and not only individually, but also collectively in terms of standard styles;

- signage, barriers and lighting. Where these are required they should be grouped and located with regard to the enjoyment of the surrounding landscape;

- drainage;

- extent and treatment of verges;

- treatment of existing parking areas;

- work area limits;

- off-site requirements;

- maintenance regimes;

- storage and re-use of materials; and

- temporary roads and tracks.

- In order to minimise the impact of the works on the landscape, the proposals should include:

- a method statement to cover scenarios which may be encountered during construction and which may affect the end product;

- a set of principles that would be adhered to in the design and execution of the works; and

- a landscape restoration plan for each bridge development, with a clear set of objectives and methodology for achieving them.

NTS

- Stressed that the landscape of Rannoch Moor is of national significance and it is felt that any bridge design and consequential road realignments should take this into consideration and be of the highest possible standard;

- The current series of bridges make up a suite of similarly designed structures that fit well within a semi-natural landscape. This is seen as being desirable and should be used as a principle for their replacement.

Highland Council

- Both Glen Coe and Rannoch Moor are areas of extreme national importance in terms of their landscape and nature conservation values;

- It is recommended that features such as parapets should be finished in natural stone, the colour of which should be akin to that found within the area;

- The Landscape and Visual appraisal should include the following:

- establish and outline methodology for assessing the said works in the context of the NSA designation for Glen Coe and Rannoch Moor and their impact on their intrinsic qualities;

- description and evaluation of existing landscape characteristics and features of the sites in relationship and importance to the National Scenic Areas;

- assessment of all works including temporary accesses, storage/compound areas, lighting, noise etc and their impact on the wider landscape setting;

- preparation and visualisations of the bridges from key viewpoints, to be agreed with the Planning Authority from the road network for passive users and for recreational users from hill tops etc.

Mountaineering Council of Scotland

- Recommend that the bridges faced off with local stone so that they blend into the landscape, possibly this could arise from additional rock cuttings associated with the schemes.

Ballachulish and Glencoe Community Council

- The Community Council would assume that any replacement bridges are of similar finished appearance to the current ones, although accept that the construction method may differ to achieve the loadings required.

5.5.6. Cultural heritage

Historic Scotland

- Historic Scotland are content that this proposal raises no significant issues and have no further comments to offer.

Highland Council

- "There are no archaeological sites in the area and the potential for unrecorded/buried remains to survive is considered to be low. I do not feel that there is a need to include a chapter on Cultural Heritage in the Environmental Statement."

National Trust for Scotland (NTS)

- It is recommended that a review be undertaken of the Sites and Monuments Records held by RCAHMS, HC or NTS to realise the possibility of such issues. Such sites could then be usefully included in report figures. NTS would argue that any impact statements which do not include a review of this information will at best be incomplete.

- NTS support the undertaking of field evaluations as it should not be presumed that the information held by NTS, HC or RCAHMS is complete. In particular, the potential of damage/destruction is not just at the places of work themselves, but also at the site huts, store areas, etc.

5.5.7. Air quality

None raised.

5.5.8. Traffic noise and vibration

None raised.

5.5.9. Pedestrians, cyclists, equestrians and community effects

Highland Council

- It is pivotal that pedestrian and public access within all of the areas of proposed workings is safeguarded and where possible improved upon;

- Expressed concern on the part of several tourism businesses in the area, with regard to disruption of traffic at all sites during the works. Pointed out that the A82 is a vital year round tourism route and that any major diversion or disruptions will have a serious impact on the local economy.

Mountaineering Council of Scotland

- Wish to see adequate space for pedestrians on the road bridges and don't want to see walkers having to run on the road itself in order to cross the bridges.

Natural Trust of Scotland

- Address safety issues of people often having to squeeze flat against the parapets as traffic passes by, often large vehicles at high speed. Traffic calming measures should also be addressed.

5.5.10. Vehicle travellers

Highland Council

- That the road be widened at the bridge location to at least 6m wide carriageway with reasonable footpath.

Ballachulish & Glencoe Community Council

- Note and support the suggestion that the replacement bridges be widened for safety reasons.

National Trust for Scotland (NTS)

- That all measures possible, including traffic calming, should be taken to reduce vehicle speeds.

5.5.11. Disruption due to construction

Land use impacts

Highlands of Scotland Tourist Board

- Expressed concern on the part of several tourism businesses in the area, with regard to disruption to traffic at all sites during the works. Point out that the A82 is a vital year round tourism route and that any major diversion or disruptions will have a serious impact on the local economy. Request that the Scoping Study include full consultation with the business community.

Nevis Range Development Company

- Many of NRDC Plc's customers are day visitors who use the A82 to get to the ski area and visitor attraction north of Fort William, and NRDC Plc are concerned about the financial implications of having the A82 either closed or seriously restricted at key periods. Some of the key periods for NRDC Plc include weekends in January and February.

Traffic and access impacts

Ballachulish & Glencoe Community Council

Disruption during construction works is of concern to the community council, and whilst they appreciate the works are necessary, they very much welcome suggestions and proposals as to how any disruption could be kept to a minimum.

Mountaineering Council for Scotland (MCoS)

- During the period when road works, and maybe road closures, are taking place in Glencoe, the MCoS will be happy to carry news of this work on its website. This would convey the news to a significant section of the mountaineering community and could help to reduce frustration if walkers and climbers were already aware of the potential delays.

Geology

None

Water quality

Scottish Environment Protection Agency (SEPA)

- One of SEPA's key interests in relation to this type of project is pollution prevention measures during the period of construction/demolition and ongoing pollution prevention measures thereafter.

Ecology and nature conservation

National Trust for Scotland (NTS)

- NTS would like to see, a strict commitment to removing, storing and replacing turves *in situ*.

- In any restoration works, only species native to the glen should be used in seed mixes.

Royal Society for the Protection of Birds (RSPB)

- The only specific concern of the RSPB is with regard to Loch Ba. A pair of Black Throated Divers attempts to nest by the loch most years but usually fail due to disturbance. Any work at the bridge here should be carried out in such a way as to avoid pollution to the loch and, if possible, done outwith the period May to July, inclusive, to minimise disturbance.

Scottish Natural Heritage (SNH)

- Once detailed plans are available, a notice of intent to carry out potentially damaging operations within the SSSIs will need to be submitted to SNH. SNH's written consent will be required before work within the SSSI commences.

Visual impacts

Scottish Natural Heritage (SNH)

- In order to minimise the impact of the works on the landscape, the proposals should include:

- a method statement to cover scenarios which may be encountered during construction and which may affect the end product;
- a set of principles that would be adhered to in the design and execution of the works; and
- a landscape restoration plan for each bridge development, with a clear set of objectives and methodology for achieving them.

Cultural heritage

Historic Scotland

- See section 5.5.6

Air quality

None

Traffic Noise and vibration

None

Health and safety

Health and Safety Executive

The works should not include measures which would conflict with the requirements of the Health and Safety at Work Act 1974 and its relevant statutory provisions.

Policies and plans

Scottish Executive Development Department

- At the National level, planning policy guidance has been produced by SEDD as statements of government policy on nationally important land use and planning matters (National Planning Policy Guidance (NPPGs)) and to provide advice on best practice (Planning Advice Notes (PANs)).

5.6. Scope of the Environmental Impact Assessment

Throughout the development of options and the detailing of the preferred option, the scope of issues requiring environmental assessment has been constantly revisited. This has resulted in certain issues being 'scoped out' i.e. it has not been deemed necessary to be considered further. This section lists these issues which have been scoped 'in' or 'out' of the Stage 3 EIA and discusses the justification for not considering them further. Table 5.3 summarises issues scoped 'in' and 'out' for further assessment.

Table 5.3 Summary of issues scoped 'in' and 'out'

Issue	Scoping of Issue for Further Assessment	Reason for scoping in/out
Land use	OUT	No significant impacts to land use.
Geology and soils	IN	Small area of disturbance to substrate and geological resources.
Water quality and hydrogeology	IN	Bridge crosses a sensitive water course.
Ecology and nature conservation	IN	Surrounding area is of high natural heritage value.
Landscape	IN	New elements will be introduced to sensitive area.
Visual issues	IN	New elements will be introduced to sensitive area.
Cultural heritage	OUT	Unrecorded archaeological features are unlikely to be found on site because the area would have been heavily disturbed during the original construction of the A82 and Ba Bridge. This has been confirmed through consultation.
Air quality	OUT	The scheme will not result in a change in traffic conditions on the bridge during the operational phase, so no increase in air pollution is anticipated.
Traffic noise and vibration	OUT	The scheme will not result in a change in traffic conditions on the bridge during the operational phase, so no increase in noise or vibration is expected, thus no impact to the nearest receptor, which is five miles away.
Pedestrians, cyclists and community effects	OUT	The scheme will improve the situation for pedestrians and cyclists by the inclusion of a footway and wider bridge.
Vehicle travellers	OUT	On-line bridge replacement.
Disruption due to Construction	IN	10 – 12 month construction in sensitive area.
Policies and Plans	IN	Slight impact.

The issues of Land use, Cultural Heritage, Air Quality and Traffic Noise and Vibration, Pedestrians, Cyclists and Community Effects, and Vehicle Travellers during operation have all been scoped out as their impacts will either not change from the current situation or improve once the scheme is in operation. However, these issues have been considered further in Chapter 10 – Disruption Due to Construction.

6. GEOLOGY AND SOILS

6.1. Introduction

This section examines how the proposed replacement of the Ba Bridge on the A82 Trunk Road in Rannoch Moor will affect the geodiversity (geology, soils and geomorphological features and processes) within the vicinity of the scheme footprint. Bridge schemes have the potential to impact upon the geology, geomorphology and soils of an area through direct and indirect impacts, loss or sterilisation of mineral deposits or soil resources, change of geomorphological process rates and alteration to geomorphological landforms, and disturbance of contaminated land or surcharging of ground that may accelerate erosion and subsidence.

Geodiversity plays an important part in determining the biodiversity of a region. Lithology has a major influence on landform and soil development by being the principal determinant of the nature and chemistry of soil and has a strong influence in determining the rate at which it forms.

Bridge replacements can affect geological resources through excavation or masking exposures of rocks or substrate, representing a serious impact if these features are not reproduced elsewhere. Similarly, removal or modification of geomorphological features can affect their scientific value or the local landscape resource. Development can also affect geological resources in a positive way, for example, new rock and facies exposures can be revealed by cuttings, which may be valuable for scientific research.

6.2. Approach and methods

This section has been prepared in general accordance with the principles and techniques outlined in 'The Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 11 – Geology and Soils'. The aims of this section are to: (1) establish the baseline geodiversity characteristics within the study area; (2) assess the predicted impacts on geodiversity; and (3) detail any mitigation measures taken to counter any possible negative effects on the characteristics of the geodiversity within the study area.

The study area for the assessment extends approximately a 100 m radius of the proposed scheme. Assessment was based on desk study of relevant plans, maps and documents (BGS, Scotland Sheet 54W, 1948; Babtie, 2004), consultation and a walk-over survey of the scheme extents and wider environment by an experienced geomorphologist.

Consultations were undertaken with a number of statutory and non-statutory Scottish bodies holding records pertinent to the assessment of geological impacts. These include:

Scottish Natural Heritage, for statutory designated Sites of Special Scientific Interest (SSSIs) of geological or geomorphological importance; and British Geological Survey (BGS), for information on local geology and soils and records of Regionally Important Geological Sites (RIGS).

6.3. Baseline conditions

The baseline conditions for geology, geomorphology, soils, geological sites of interest, hydrogeology and contaminated land are described.

6.3.1. Solid geology

The Solid geology map (Sheet 54W) indicates that Ba Bridge is located in an area dominated by granite with the exception of flaggy psammitic granulite to the south west. The granite belongs to the Argyll Granites. The map indicates the presence of a major fault running southwest – northeast and aligned with the Laidon and Ericht lochs. Jacobs Babtie (2004) indicates that the site is generally underlain by very strong, grey, crystalline slightly weathered to fresh granite. Rock-head level was encountered at 290.25 m AOD to the north of the bridge, and at 290.07 m AOD to the south, approximately 2 m below the present surface. There are few bedrock exposures within Rannoch Moor and none around Ba Bridge.

6.3.2. Drift geology

The A82 runs approximately northwest to southeast on embankment up to 3 m high (Figure 6.1), the slopes of which are covered by grass, shrubs and heather. The surrounding area is relatively flat, consisting of heather covered blanket peat (higher ground) and blanket bog (lower ground). According to the BGS Drift Geology Map (Sheet 54W), the study area is underlain by morainic drift deposits, which are extensive and well developed. They comprise very dense, organic, clayey, gravely, sand, and cobbles.

Figure 6.1 Road raised on embankment

6.3.3. Soils

The whole of the terrestrial part of the study area is underlain by peat of varying types. Rannoch Moor contains the most extensive complex of western blanket and soliginous/valley mire in Britain. Peat is an important carbon store, and so Rannoch Moor is one of the largest carbon stores of its type in the UK.

6.3.4. Geomorphology

Rannoch Moor is important geomorphologically because it is believed to be, or be close to, the centre of ice-sheet growth in the UK during the last maximum glaciation and Younger Dryas re-advance. Therefore, it exhibits important palaeo-ecological indicators of climate change since deglaciation and glacial features associated with the deglaciation, such as moraines, drumlins and eskers (Figure 6.2). The area around Ba Bridge, which is only a very small area within Rannoch Moor, is characterised by large hummocky moraines or drumlins with associated hollows (Figure 6.3). The bridge sits in a flat, low area of ground between two hummocky moraines to the north and south that bound the area of proposed construction. Active geomorphology is confined to the River Ba and Loch Ba. Fluvial geomorphology is discussed further in Chapter 7 and Appendix B.

Figure 6.2 The vast expanse of Rannoch Moor blanketed with deglaciation features such as moraines and drumlins.

Figure 6.3 Hummocky moraine or drumlin immediately adjacent to the road on the north side of the river. The cutting is immediately adjacent to the road (centre of picture).

6.3.5. Sites of interest

Ba Bridge is located within the Rannoch Moor SSSI and the Ben Nevis and Glen Coe National Scenic Area (Figure 3, Appendix A). Rannoch Moor SSSI is of international nature conservation importance. It contains the most extensive complex of western blanket and soliginous/valley mire in Britain and is of particular importance on account of its range of northern mire types. Ba Bridge spans the River Ba, which is part of the Rannoch Moor Special Area of Conservation (SAC), designated for nine qualifying interests, the most pertinent for this chapter being blanket bog, depressions on peat substrates and acid peat-stained lochs and ponds. There are no designated sites of geological interest identified in the area of the proposals.

6.3.6. Mining and contaminated land

Historical Ordnance Survey maps available for the area (first and second editions from 1906 and 1968) indicate that land use has remained unchanged. No history of mineral extraction within the area was suggested by the maps.

Selected chemical tests (pH and sulphate) were carried out during site investigations (Babtie, 2004) indicating that the drift deposits have a pH of 7.4 to 8.9 and a sulphate content of 0.02 to 0.04 g/l. No contamination was evident, which is consistent with the land use history.

6.3.7. Hydrogeology

Historical Ordnance Survey maps indicate that surface water levels in Lochan na Stainge and Loch Ba fluctuated between 290 and 305 m AOD, suggesting that those surface water levels are likely to be a reflection of groundwater level and precipitation amounts. The large range of values could possibly represent error associated with historical surveying. Groundwater will, however, vary through time due to climatic conditions. The maps also indicate that the Ba Bridge area is traditionally very wet due to a high water table maintained by high levels of precipitation and local geology and topography. The bedrock aquifers in this area are characterised by fracture flow with very low productivity.

6.4. Impact assessment

For the purpose of this assessment, the following criteria have been used to assess the value or sensitivity of the geological, geomorphological and soil attributes within the study area (Table 6.1). Specific criteria for the assessment of contaminated land, mineral extraction and hydrogeology are undefined because they are not believed to be of consideration for Ba Bridge. The sensitivity criteria are considered along with the assessment of impact magnitude, defined in Table 6.2 to derive the significance of each impact as illustrated in Table 6.3.

Table 6.1 Site value criteria for geodiversity

Sensitivity	Description
High	Any nationally or internationally designated geological site and/or the presence of non-substitutable or highly sensitive geological, geomorphological or soil attribute(s).
Medium	Any regionally or locally designated sites and/or the presence of geological, geomorphological and soil attributes with limited potential for substitution or moderate sensitivity.
Low	Non-designated sites and/or the presence of geological, geomorphological and soil attributes easily substitutable or with low sensitivity.

The magnitude of impact (Table 6.2) was assessed independently of the site value and assigned to one of the following categories based on professional judgement.

Table 6.2 Impact magnitude criteria for geology, geomorphology and soils.

Magnitude of Impact	Degree of Impact
Major	Where there would be partial (greater than 50%) or total loss of a site or feature of geological, geomorphological or pedological importance, or where there would be complete severance of a site such as to affect the value of the site to a major degree.
Moderate	Where there would be partial loss (between approximately 15 to 50%) of a site or feature of geological, geomorphological or pedological importance, major severance, major effects to the setting, or disturbance such that the value of the site or feature would be affected, but not to a major degree.
Minor	Where there would be a minimal effect on a site or feature (up to 15%), or an infinitesimal effect on its setting, or where there would be a minor severance or disturbance such that the value of the site or feature would not be affected.
Negligible	Very slight change from baseline conditions. Change hardly discernible, approximating to a 'no change' condition.

The assessment of the impact, either beneficial or adverse, is a function of the value of the site and the magnitude of impact (Table 6.3). The assessment classification has four categories; Major, Moderate, Slight and Negligible. For the purposes of this assessment, impacts assessed as being moderately negative or greater, and any positive impacts are considered to be significant in terms of the Environmental Impact Assessment (Scotland) Regulations 1999.

Table 6.3 Assessment of impact

	Magnitude of impact			
Site value	*Major*	*Moderate*	*Minor*	*Negligible*
High	Major	Moderate/Major	Slight/Moderate	Negligible
Medium	Major	Moderate	Slight	Negligible
Low	Slight/Moderate	Slight	Negligible	Negligible

6.5. Predicted impacts

The predicted impacts have been assessed in relation to drift geology, geomorphology and pedology. Further impacts associated with the construction phase of the scheme are considered fully in Chapter 10. There will be no significant impact to the hydro-geological resource (lithology only) because there will be no significant change in the levels of associated pollution from the scheme. Groundwater within the organic layer, which in this location is entirely peat, is important as it maintains peat structure. The scale of the works and the site will mean that ground contamination is unlikely. Mineral extraction is not an issue at the site.

There will be a small volume of drift deposit excavated for the works in order to accommodate the wider bridge structure, the temporary bridge structure and the new drainage ditch on the

SE side of the bridge. The two hummocky moraines (or drumlins) may be cut exposing the structure of the minerogenic substrate from the moraines which could be of benefit for scientific research. The amount of material excavated from the moraines and areas closer to the river will be insignificant when compared to the extent of deposits within Rannoch Moor. No other geomorphological features will be affected by the scheme, therefore the impact on the local geomorphology and drift geology can be assessed as slight.

There will be a small volume (estimated at 10 m^3) of peat excavated for the widening of the embankments, construction of the temporary bridge and excavation of the new drainage ditch. Peat is a medium value receptor and is primarily important due to the habitats which it supports. The small amount of peat which will be impacted as a result of the scheme is considered to be minor and therefore the overall impacts on the peat resource are assessed to be slight. The Rannoch Moor SSSI is cited for its important mire habitats and there are no specific geological features forming part of the designation. There will be no permanent loss of any habitats that are notified SSSI features during operation. More detail on the impacts on the associated habitats are dealt with in Chapter 8 (Ecology and Nature Conservation). Overall, there is predicted to be a slight impact on soils as a result of the scheme.

6.6. Mitigation

Permanent loss of habitat will be restricted to small areas immediately adjacent to the existing carriageway. However, additional damage to adjacent habitats should be minimised during construction by adopting best practice construction procedures that limit movements of heavy machinery and restrict access to adjacent areas.

In order to avoid significant long-term adverse impacts on the surrounding semi-natural habitat, peatland turf removal, storage and replacement (translocation) strategies are advised and will include the following steps:

- The turves should be mapped, logged (labelled) and then stored in such order to allow them to be replaced in as close to their original location as possible. To aid this process, photographs should be taken of the site prior to and during the removal of the turfs.

- Turves and blocks should be removed by hand or using a small excavator to maintain the homogeneity and physical structure of the peat and to prevent undue fragmentation.

- Immediately following removal, peat turves and blocks should be kept in storage bags with the vegetated layer on the top and the un-vegetated root matt beneath. Some of the turves can be stored on areas of the existing damaged peat near the lay-by. The blocks should be kept in storage bags until replaced.

- To avoid desiccation of the peatland material during dry periods or of high temperature, the peatland expert/geomorphologist should advise the construction team if watering is required.

- There is likely to be some shrinkage in the peat blocks, loss of structure and loss of material, so there may be a need to use locally sourced fill at the base of the excavations before peat blocks are placed back. When transplanting the peat blocks they should be packed as tightly as possible (but without compacting the peat) and

layered in horizons according to their physical structure to minimise the impact on the sub-surface peat hydrology. The turves should be replaced according to their labelling to recreate the original mire surface.

- Photographs should be taken at this stage to monitor the regeneration of the area.
- Monitoring of the newly translocated peatland areas should be undertaken for a minimum of 3 years by the developer, local authorities, or local voluntary groups and organisations.
- No seed mix should be required using this approach – however if seed mix is to be used then no Perennial Ryegrass (*Lolium perenne*) should be in the mix as this is an alkali-loving plant which will die out over time on the acid-rich substrate leaving a 'scar' on the landscape. Any seed mix to be used will comprise species native to the area and of local provenance where possible.

6.7. Residual impacts

Following the mitigation measures detailed, residual impacts on geological and soil resources of the study area are assessed as negligible. No cumulative impacts upon geology and soils have been identified.

7. ROAD DRAINAGE AND THE WATER ENVIRONMENT

7.1. Introduction

This section examines how the proposed replacement of the Ba Bridge on the A82 Trunk Road in Rannoch Moor will affect the road drainage and water environment within the vicinity of the scheme footprint (Figure 1, Appendix A) during the operational phase of the scheme. Bridge schemes have the potential to impact upon the water quality and drainage of an area through direct and indirect impacts, road pollutants entering watercourses and alteration to the local hydrology. It has been assessed that the potential operational impacts of the scheme are inorganic and organic pollution, sediment loading, changes in discharge regime with a resultant impact on sediment transport and fluvial geomorphology. The majority of the impacts will be associated with the construction phase, and are discussed further in Chapter 10.

7.2. Methods

This section has been prepared in general accordance with the principles and techniques outlined in 'The Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 10 – Road drainage and the water environment'. The aims of this section are to: (1) establish the baseline water quality and natural and anthropogenic drainage within the vicinity of the scheme footprint; (2) assess how the scheme will affect local water quality and drainage; and (3) detail any mitigation measures required to minimise impacts on the water quality and drainage within the vicinity of the scheme footprint.

The assessments were based on desk study of relevant plans, maps and documents, consultation and a walk-over survey of the scheme extents and wider environment by a hydrologist/fluvial geomorphologist. There will be no assessment of the pollution impact from accidental spillages.

A geomorphological study is presented in Appendix B. The study is based on findings from a desk study and site visit. This represents a reconnaissance style appraisal rather than a detailed geomorphological dynamics assessment, as this requires process monitoring and is beyond the scope of the appraisal. The desk-based approach, conducted prior to and following the field visits, concentrated on reviewing existing project documentation, site maps and existing geomorphological publications. The desk study was designed to place the river reach at Ba Bridge into the context of the wider catchment. The field visit focused on determining bridge specific baseline conditions, including contemporary channel morphology, channel bed and bank characteristics and the quantities and size of sediment within the river channel. Data collection involved note taking, the production of geomorphological maps, and photography. The interpretations and predictions made in this report are based on professional judgement.

7.3. Baseline conditions

The baseline conditions for the catchment area, standing waters, watercourses, groundwater, water quality, fluvial geomorphology and existing road drainage are described below.

7.3.1. Catchment area

The bridge scheme sits within the River Ba Catchment (Figure 1), which is a sub-catchment within the River Tay catchment area, and drains an area approximately 40 km^2 (Figure 7.1). The waterlogged condition of the ground and the poor quality of the vegetation as grazing for stock has made most of the site unsuitable for agricultural use. However, there has been relatively intensive cattle grazing on the Moor in the past. Historically, it is likely that peat cutting took place in the vicinity of all bothies, including Ba Cottage. It is well documented that the moor supported an extensive cover of pine during the Holocene, however, due to human activities the Moor is now devoid of extensive natural tree cover (Figure 7.1). There are small pockets of plantation forestry within the Ba catchment.

Figure 7.1 Catchment area for the River Ba devoid of extensive tree cover.

The River Ba drains a mountainous catchment area to the west of the bridge. To the south, streams drain from Stob a' Choire Odhair and Stob Ghabhar, to the west they drain from Aonach Mor, and to the north they drain from Clach Leathad and Meall a' Bhuiridh, the highest of the mountains at 1108 m. The numerous mountain streams converge to form the River Ba, which itself has its source in Coireach a' Ba, immediately west of Aonach Mor. The area has a high gradient with water flowing from a maximum elevation of 1108 m to 290 m OD at the bridge. Within the catchment there are several small lochs. Because of the steep gradient, the hydrology is likely to be flashy and highly responsive to rainfall and snowmelt, however, some of this responsiveness will be attenuated by the smaller lochans and the larger lochs (Loch Buidhe and Lochan na Stainge) immediately upstream of the bridge. Immediately downstream of the bridge the River Ba flows into Loch Ba and subsequently into Loch Laidon.

According to data from the SEPA gauging station at the neighbouring Linne nam Beathach at Victoria Bridge, the average annual rainfall for the area is 2956 mm.

7.3.2. Standing water

To the west of the bridge is Lochan na Stainge and to the east is Loch Ba (Figure 7.2). Lochan na Stainge is an amalgamation of small lochans and anastomosing channels. It is approximately 1 km long and varies in width from 20 m to 769 m, with a maximum depth of 9.1 m (Murray and Pullar). Loch Ba is a much larger loch with several islands. Its' length is approximately 4 km and its width ranges from 30 m to 1200 m, with a maximum depth of 4.3m (Murray and Pullar). The bridge is closer to Loch Ba than to Lochan na Stainge, with the two lochs only separated by 500 m of river. They are known to be used for fishing and form part of a group of local lochs that support 4% of the British population of black-throated divers, *Gavia arctica*.

Figure 7.2 Loch Ba west of Ba Bridge.

7.3.3. Watercourses

Within the study area of the scheme, the River Ba is the only natural watercourse. In the vicinity of Ba Bridge the river has a relatively low gradient with low stream power (Figure 7.3). It was approximately 20 m wide at the time of survey and the depth was approximately 0.5 m, averaged over the width of the river. The flow is characterised by pools and riffles, with zones of faster flowing water (Figure 7.4) and zones where the water appears motionless (Figure 7.5) and even small areas of backflow. The river banks are low and well vegetated (Figure 7.6). However, the banks within the water are steeper and can be composed of bedrock, boulders, cobbles, sandy diamict glacial deposits, peat or possibly regolith (Figure 7.7). The lichens on the in-stream boulders suggest that flood flows rarely rise more than 40 cm from base flow (Figure 7.4). The bed material consists of cobbles and gravel with large boulders protruding through the water surface (Figure 7.8). There is only one section of fast flow between the two lochs about 50 m west of the bridge, in a section of the river with many in-stream boulders (Figure 7.4). It should be highlighted that this river is very natural, and except for the construction of the bridge has undergone very little anthropogenic modification.

Figure 7.3 River Ba within the vicinity of Ba Bridge, looking west.

Figure 7.4 Rippled flow in River Ba immediately west of Ba Bridge

Figure 7.5 Areas of slow flow in the River Ba.

Figure 7.6 Vegetated river banks.

Figure 7.7 Bank material, comprising till underlying an organic soil.

Figure 7.8 In-stream bed material.

7.3.4. Groundwater

There are no important aquifers at the site. The bedrock aquifers that do exist are characterised by fracture flow and are of very low productivity, while the limited superficial aquifers are characterised by intergranular flow and low productivity. The water table is high, creating waterlogged conditions across the Moor.

7.3.5. Water quality

The protection of water resources has become increasingly important under the terms of the Water Framework Directive and is particularly relevant due to the ecosystems that may be affected by proposed developments, either directly or indirectly. The Water Framework Directive was transposed into Scottish law through the Water Environment and Water Services (Scotland) Act 2003 and requires that all water bodies must meet specific environmental objectives in order to achieve at least Good Ecological Status by 2015 with no deterioration in status in following river basin planning cycles. Heavily Modified Water Bodies will be required to achieve 'Good Ecological Potential' under the legislation.

SEPA are in the process of moving towards a new surface and groundwater classification scheme which is required under the Water Framework Directive. This new scheme will report status or potential of water bodies, however, currently they are still using the existing River Classification Scheme to report water quality of rivers throughout Scotland. Generally only watercourses with catchment areas larger than 10km^2 are included, therefore many smaller watercourses may remain 'unclassified'. The scheme is based on a five point scale and runs from A1 (excellent) to D (seriously polluted). The River Ba was last classified as A2 'Good'.

The River Ba has been risk-assessed by SEPA as a 2b waterbody which means that it is not at risk of failing to achieve Good Ecological Status in 2015 under the terms of the Water Framework Directive.

In 2000, 200 Scottish lochs were classified using the Standing Waters Classification Scheme and Loch Ba received a classification of Class 1 (Excellent) – 'lochs not significantly altered by human activity'.

7.3.6. Existing road drainage

Road drainage from existing bridge is currently via pipes that discharge directly into the River Ba. There is also a large roadside drainage ditch on the north-east side of the road along the bottom of the embankment that discharges into the river (Figure 7.9). On the opposite side of the road there is a small channel at the foot of the embankment that flows south into the river. On the south side of the road there are no channels. There is, however, an area of boggy ground on the west side of the road that appears to have formed since the creation of the embankment which has resulted in the damming of surface water flow in this area.

Figure 7.9 Embankment-toe drainage ditch on NE side of Ba Bridge.

7.3.7. Fluvial geomorphology

The active fluvial geomorphological processes operating at Ba Bridge are the transportation and deposition of sediment, and erosion of bed and bank material under flood conditions. The relatively short, low gradient section of river means these processes are infrequent and of low magnitude due to the low energy of the river.

7.3.8. Impact assessment

The importance of hydrological features within the vicinity of the scheme footprint has been classified using criteria set out in the DMRB V11, Section 3, Part 10 (

Table 7.1).

Table 7.1 Site sensitivity of water quality and drainage

Site sensitivity - water quality/drainage	Criteria
Very High	Attribute has a high quality and rarity on regional or national scale. Surface waters are EC designated Salmonid/Cyprinid fisheries, have a River Quality Classification of Grade A1 Excellent and are protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site). Groundwater is characterised by a major aquifer providing a regionally important resource or supporting site protected under wildlife legislation. Presence of a flood plain or defence protecting more than 100 residential properties from flooding.
High	Attribute has a high quality and rarity on local scale. Surface waters have a River Quality Classification of A2 Good, are major cyprinid fisheries and support species protected under EU or UK wildlife legislation. Groundwater aquifers provide locally important resource and support river ecosystem. Presence of a flood plain or defence protecting between 1 and 100 residential properties or industrial premises from flooding.
Medium	Attribute has a medium quality and rarity on local scale. Surface waters have a River Quality Classification of Grade B. Groundwater aquifers provide water for agricultural or industrial use with limited connection to surface water. Presence of a flood plain or defence protecting 10 or fewer industrial properties from flooding.
Low	Attribute has a low quality and rarity on local scale. Surface waters have a River Quality Classification of Grade C and D. There are no aquifers and there is a floodplain with limited constraints and a low probability of flooding of residential and industrial properties.

DMRB criteria (Table 7.2) have been used to estimate the magnitude of an impact on an attribute, because there are no specific criteria set out for hydrological features.

Table 7.2 Criteria for determining the magnitude of impact.

Impact magnitude	Criteria
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute.
Minor Adverse	Results in some measurable change in attributes quality or vulnerability.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.
Minor Beneficial	Results in some beneficial affect on attribute or a reduced risk of negative effect occurring.
Moderate Beneficial	Results in moderate improvement of attribute quality.

Major Beneficial	Results in major improvement of attribute quality.

The impact of the replacement of the Ba bridge upon the hydrological features within the vicinity of the scheme footprint is estimated using Table 7.3. The impact of effects (either beneficial or adverse) is a function of the importance of the attribute and the magnitude of impact.

Table 7.3 Significance of the impact of the scheme on local hydrology and water quality

	Magnitude of impact			
Site value	*Major*	*Moderate*	*Minor*	*Negligible*
Very High	Very Large	Large/Very Large	Moderate/Large	Neutral
High	Large/Very Large	Moderate/Large	Slight/Moderate	Neutral
Medium	Large	Moderate	Slight	Neutral
Low	Slight/Moderate	Slight	Neutral	Neutral

7.4. Predicted impacts

The following description of the predicted impacts of the proposed scheme is based on an assessment of the scheme in the absence of any mitigation, which would regulate discharge and minimise pollution. The impacts are described first in relation to changes in the hydrological regime and, second, in relation to the effects on water quality.

There will be no noticeable changes to the regime of the hydrological system within the study area as a result of the bridge replacement, during either the construction or operational phases. The existing in-stream piers are to remain *in situ*, thus the local flow regime will be unaltered. There will be no significant increase in sedimentation to the watercourse post construction because the areas excavated will have been small and flat so any surface water runoff generated on these areas will be unlikely to transport material. Furthermore, excavated areas will be several metres from the channel banks and silt traps will be installed to ensure that sediment is prevented from entering the watercourse. During the operational phase, surface-water discharge from the road will not drain directly into the River Ba as it currently does, but will discharge into a roadside swale east of the bridge via a combined kerb and drainage system. There will be a slight increase in the amount of run-off from the bridge due to the increased area of hard standing. However, because the surface water will be diverted through catch pits and into a swale rather than running directly into the river the water quality is predicted to improve downstream of the bridge providing a moderate beneficial impact to water quality.

Full consultation with SEPA indicated that there were no issues with flooding. In addition, there are no properties within the area which could be considered at risk, the road is on raised embankments and attenuation is provided by the lochs at either end of the small section of river running underneath the bridge.

No significant cumulative impacts have been identified in relation to the water environment.

7.5. Mitigation measures

The existing road drainage discharges directly into the River Ba, the proposed design will result in surface-water runoff being diverted into a swale that will start 40 m south of the River Ba and discharge into the river downstream of the bridge. This will help to improve the water quality of the surface water entering the river through the filtering out of sediment and pollutants.

Catch pits will also form part of the drainage scheme and these will also attenuate run-off and help to reduce sediment and pollutants entering the watercourse.

Silt traps will be installed during all construction works in order to intercept surface water run-off and prevent siltation of the river. They will be checked and maintained throughout the duration of the works.

In addition, the Scottish Environment Protection Agency Pollution Prevention Guidelines will be strictly adhered to during both construction and operation phases. Mitigation measures specific to the construction phase are outlined in Chapter 10 - Disruption due to construction.

7.6. Residual impacts

The minor change in road drainage and the fact that there will be no change in the number of road users will result in an improvement in the level of organic and inorganic road pollutants entering the River Ba, thus improving the water quality.

8. ECOLOGY AND NATURE CONSERVATION

8.1. Introduction

This section examines how the proposed replacement of the Ba Bridge on the A82 Trunk Road in Rannoch Moor will affect ecology and nature conservation within the vicinity of the scheme (Figure 1, Appendix A). This section has been prepared in general accordance with the principles and techniques outlined in 'The Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 4 – Ecology and Nature Conservation'. The aims of this section are to:

- establish the baseline ecology and nature conservation designations within the vicinity of the scheme footprint;
- assess how the operation of the scheme might affect local ecology and nature conservation;
- detail any mitigation measures taken to counter any possible negative effects on the ecology and nature conservation interests within the vicinity of the scheme, and
- assess the significance of residual effects.

8.1.1. General site description

The A82 Ba Bridge is located in Rannoch Moor, which is an extensive formerly glaciated low-level plateau surrounded by uplands. It is of particular ecological importance due to its range of northern mire types and represents the most extensive complex of western ombrogenous blanket bog and soligenous/valley mire in Britain. The site also contains a range of open water habitats in the form of lochs and lochans.

Rannoch Moor is the only remaining locality for a nationally rare vascular plant species, Rannoch-rush (*Scheuchzeria palustris*), and contains several other nationally and locally rare species. The study area predominantly comprises wet heath habitat. The habitat is extremely variable, its composition dependant upon the topography of the local area.

The scheme area lies wholly within the Rannoch Moor Site of Special Scientific Interest (SSSI), the Rannoch Moor Special Area of Conservation (SAC) and is immediately adjacent to Loch Ba. Loch Ba is part of the Rannoch Lochs Special Protected Area (SPA) and the River Tay SAC which is designated for Atlantic salmon, three species of lamprey, otter, acid peat-stained lochs and ponds, wet heathland with cross-leaved heath, clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels, and very wet mires often identified by an unstable 'quaking' surface. Furthermore, Rannoch Moor has been designated a Ramsar site, a National Nature Reserve (NNR) and a National Scenic Area (NSA) (Figure 3, Appendix A).

The site qualifies as a SAC due to the presence of four habitats that are listed on Annex I of the EC Habitats Directive. In addition, three other Annex I habitats and two Annex II species are present as qualifying features, but not primary reasons for SAC selection (Table 8.1). Further details are provided in Appendix F which also includes the Rannoch Moor SSSI and Rannoch Lochs SPA citations. Rannoch Lochs SPA comprises a cluster of eight oligotrophic

lochs. This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of black-throated diver (*Gavia arctica*), a species listed in Annex I of the EC Habitats Directive.

Table 8.1 Annex I habitats and Annex II species present in Rannoch Moor SAC

Annex I habitat/ Annex II species	Primary reason for SAC site selection
Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	Yes
Natural dystrophic lakes and ponds	Yes
Blanket bogs	Yes
Transition mires and quaking bogs	Yes
Northern Atlantic wet heaths with *Erica tetralix*	No
European dry heaths	No
Depressions on peat substrates of the Rhynchosporion	No
Invertebrate species afforded protection under Annex II of the European Habitats Directive	No
Otter, *Lutra lutra*	No

The planning guidelines, international commitments, legislation and planning policies relevant to the protection, conservation and enhancement of nature conservation interests in relation to the scheme are given in Appendix G.

8.1.2. Consultation

Scoping was carried out in order to identify the key ecological issues to be addressed in the appraisal. A major part of the scoping included consultations with statutory and non-statutory bodies. Consultees were contacted initially by Jacobs Babtie in 2003, informing them of the details of the proposed development and requesting that they provide any specific baseline information that they may hold or any comments they may have concerning the proposed scheme. A further consultation was conducted by Scotland TranServ in November 2006 to determine if any new environmental issues had developed since the initial consultations by Jacobs Babtie. Details of these consultations in relation to ecology can be found in Sections 5.5.4 and 5.5.11, plus Appendix C, Section 1.2. RSPB were consulted in January 2007 on bird issues, and a final consultation with SNH was undertaken in March 2007 to confirm that the main environmental issues were unchanged.

The main consultees who responded on nature conservation issues were:

- Scottish Natural Heritage (SNH);
- Highland Council;
- National Trust for Scotland (NTS);

- Royal Society for the Protection of Birds (RSPB); and
- Scottish Environment Protection Agency (SEPA).

A search was also undertaken to identify any statutory and non-statutory sites designated for nature conservation value within or adjacent to the site. Evaluation of species and habitats was achieved with reference to European and National designations including local and national Biodiversity Action Plans.

Following the recommendations of these consultations an NVC Habitat Survey, water vole (*Arvicola terrestris*), otter (*Lutra lutra*) (see Appendices C and E) and Freshwater Protected Invertebrate) (Confidential Appendix D) surveys were performed.

8.2. Methods

Desk and field based methodologies and mitigation assessments were based on European and UK Nature Conservation legislation and associated best practice guidelines, produced by the Joint Nature Conservation Committee (JNCC), and the DMRB manual, specifically Volume 10 (Environmental Design and Management) and Volume 11, section 3, part 4 (Ecology and Nature conservation)

The National Biodiversity Network Gateway (NBN), http://data.nbn.org.uk/, was searched for records of flora and fauna occurring within the vicinity of Ba Bridge.

An ecological desk study, extended Phase 1 and NVC surveys, as well as species-specific surveys have been undertaken to address the baseline ecological conditions and value of the site, and to identify any opportunity for biodiversity enhancement as a result of the proposed scheme.

Baseline information on the ecology and natural environment within the study area, and in the context of the surrounding landscape, was ascertained through a desktop study and a suite of field surveys to support the Environmental Statement. The field surveys were conducted up to a 500 m radius of the bridge. A full Phase 1 habitat survey (following standard JNCC techniques) was undertaken alongside a more detailed NVC survey and protected species survey on 17th November 2005 by Jacobs Babtie. Follow-up surveys were conducted by Mouchel Parkman (now Mouchel) in August 2007 and Scotland TranServ during June, August and September 2008 (see Appendices D and E).

Although some of the survey work was undertaken over 12 months ago the findings are still considered to be valid and the ecological baseline is unlikely to have changed in this time period.

Baseline conditions of the river habitat have been identified through consultations with statutory consultees, a review of relevant published literature and site visits. Information was also gathered from ecology reports (Jacobs Babtie, 2003) and information on environmental designations in the area of the site. The Scottish Environment Protection Agency (SEPA) reports baseline conditions for watercourses following its current River Classification Scheme.

The methodology used for impact assessment and evaluation adheres to the Institute of Environmental and Ecological Management (IEEM) 'guidelines for ecological assessment in the United Kingdom' (2006). This approach involves identifying and evaluating the potential

impacts of defined actions on ecosystems or their components recognised or suspected to be present at the site. The assessment of potential ecological impacts pre- and post-mitigation involves an evaluation of the value of each affected ecological receptor (Section 8.3) and an assessment on likelihood of changes/activities occurring and of the significance of potential impacts (Section 8.5).

8.2.1. Habitat Surveys

All areas of semi-natural habitat identified as being of nature conservation importance (local, county, national and international importance), were surveyed in more detail using the National Vegetation Classification (NVC) Phase 2 survey techniques (Rodwell, 1991 *et seq*). All habitats encountered within 100 m of the existing Ba Bridge were assessed and coded according to the NVC system. Botanical taxonomic nomenclature follows that of Stace (1997) and/or Rodwell (1991 *et seq*).

8.2.2. Protected Species Surveys

Otter

Otters have full legal protection under the Wildlife and Countryside Act 1981, as amended, and are also protected under the Conservation (Natural Habitats) Regulations 1994, making them a European protected species. As such, it is an offence to intentionally or recklessly kill, take or injure an otter; disturb an otter; destroy, damage or obstruct access to a place of shelter or the shelter itself.

A search of the NBN revealed numerous records of Otter within the same 10km square as Ba Bridge as well as one record within Loch Ba itself.

On the 17th of November 2005, watercourses were systematically searched for signs of otter based on the methodology by Chanin (2003). Signs of otters which were searched for included spraints, footprints, lying-up sites, potential holts or couches, and meal remains (Appendix C).

A follow-up survey on the 11th August 2007 searched the banks of the River Ba within 100m of the bridge, again based on the methodology described in Chanin (2003), paying particular attention to likely sprainting sites such as around the bridge (Appendix E).

Water Vole

In the uplands of Scotland, water voles are often found around watercourses which flow through areas of deep peat with marshy floodplains (Raynor 2005). Water voles are protected under the Wildlife and Countryside Act 1981, as amended, which makes it an offence to damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection. It is also an offence to disturb water voles while they are using such a place.

A search of the NBN showed no records of water vole.

On the 17th of November 2005, watercourses were systematically searched for signs of water vole (Strachan 1998) (Appendix C). Signs of water voles were searched for and these included burrows, runs, footprints, feeding stations, latrines, and faeces.

A further survey for water vole was carried out in conjunction with otter surveys on 11th August 2007, covering all potentially suitable habitats within ~100m of the bridge. The survey was based on the methodology described in Strachan and Moorhouse (2006) and involved detailed searches for field signs such as droppings, latrines, feeding stations, burrows, footprints and runs (Appendix E).

Bats

All UK bat species are listed on Schedule II of the Conservation (Natural Habitats, &c) Regulations 1994 and as such are European protected species. It is illegal to deliberately or recklessly disturb bats (whether in roost or not) or damage, destroy or obstruct bat roosts. The obligation of the agreement on the Conservation of Populations of European Bats (EUROBATS 1994) is to identify and protect shelter and feeding sites that are important for the conservation status of bats.

A search of the NBN showed no bat records in the vicinity of Ba Bridge.

The existing bridge was assessed in terms of its suitability to support bat roosts and a bat survey was undertaken on 11th August 2007 to establish the presence or absence of bats in the survey area. Further details of the Bat survey are given in Appendix E.

Invertebrates

The river is known to support a population of a protected species of freshwater invertebrate. A survey was undertaken in November 2005 by Jacobs Babtie to establish the extent and assess potential impacts on the population with a further survey being conducted by Scotland TranServ environment team in August and September 2008. The results are to be found in Confidential Appendix D.

Other Species

A search of the NBN found records the following species in the same 10km square as Ba Bridge, namely, Black Grouse, *Tetrao tetrix*, Common Lizard, *Zootoca vivipara*, Badger, *Meles meles*, mountain hare, *Lepus timidus* and Wildcat, *Felis sylvestris*. However, consultation and subsequent field study did not indicate their presence in the vicinity of the proposed works and thus further consideration is not required.

The nests, eggs and young of all species of wild bird are protected from deliberate damage during the breeding season (March to August inclusive) under the terms of the Wildlife and Countryside Act 1981, as amended. It is best practice to minimise the potential for such damage by removing vegetation likely to be used by breeding birds outside of the breeding season.

The area was also surveyed for signs of reptiles in conjunction with the Phase 1 habitat survey in November 2005. Other key species known to be present but not individually surveyed are included in the evaluation and assessment of the appropriate habitat section. Mitigation for these species is also included.

8.2.3. Limitations

Habitat surveys

Although November is sub-optimal for conducting vegetation surveys with many species in a state of senescence, identification of the key habitat types and dominant species is still possible by experienced botanists. However, it is likely that early-flowering species and annual species may be under-represented in surveys undertaken at this time of year.

Protected Species

Otters are active throughout the year (Chanin 2003b), but the optimum period to carry out surveys is between May and September, when water levels are less variable (Chanin 2003a).

Similarly, the optimum period to carry out water vole surveys is between April and October, when the likelihood of locating breeding territories is highest (Strachan 1998).

8.3. Ecological value assessment

The 'value' of an ecological resource (for example a habitat or a species) requires definition within a geographical context. Each feature relevant to the study area is assessed as valuable, or potentially valuable, based on the following geographic frame of reference:

- **International**; e.g. SPAs, SACs or Ramsar Sites;
- UK;
- **National**; (i.e. Scotland), e.g. SSSIs;
- **Regional**; e.g. habitats or species valuable at a regional (i.e. Strathclyde or Tayside) level;
- **County**; e.g. sites valuable at a county (i.e. Argyll and Bute or Perth and Kinross) level;
- **District**; e.g. habitats or species populations of value at the district (i.e. Rannoch Moor) level;
- **Local**; e.g. habitats or species populations of value in a local context (i.e. within ~ 5 km of the scheme extent); and
- Within the immediate zone of influence of the scheme only (i.e. within the working area).

In accordance with IEEM (2006), the value of habitats and species is measured against published selection criteria where available. Reference is also made to UK and local Habitat Action Plans (HAPs) and Species Action Plans (SAPs) (http://www.ukbap.org.uk/) although, as the guidance notes indicate, the inclusion in an HAP or SAP reflects the fact that the habitat or species concerned is in a sub-optimal state and that conservation action is required. Therefore, it does not necessarily imply any specific level of value to the habitat type concerned. Two local Biodiversity Action Plans (LBAPs) cover the Rannoch Moor area. These are the Argyll and Bute LBAP and the Tayside LBAP.

For the purpose of this assessment, the criteria described in Table 8.2 have been used to assess the nature conservation/biodiversity value of the ecological receptors within the study area.

Table 8.2 Evaluation of the Nature Conservation/biodiversity value of ecological receptors.

Value	Criteria	Examples
International	High importance and rarity, international scale and limited potential for substitution	Internationally designated sites (e.g. SACs, SPAs, cSACs, pSPAs, World Heritage Sites). A discrete area which meets the published selection criteria for international designation. A viable area of habitat type listed in Annex 1 of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of any species that is globally vulnerable (or of more threatened status) as listed by the International Union for the Conservation of Nature. A regularly occurring population of a European Protected Species (as listed on Schedule 2 or 4 of the Habitats Regulations), which is also a UK Red Data Book Species (i.e. listed in one of the UK Red Data Books or in expert update lists). A regularly occurring, nationally significant population/number of any internationally important species.
National	High importance and rarity, national scale, or regional scale with limited potential for substitution	Nationally designated sites, e.g. SSSIs. Regionally important sites with limited potential for substitution. A discrete area which meets the published selection criteria for national designation. A viable area of priority habitat identified in the UK Biodiversity Action Plan (BAP) where the management states that all areas of the particular habitat should be protected, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Viable areas of key habitat where the need for protection is identified in the Regional BAP/Natural Areas profile of regional value and which have limited potential for substitution, or smaller areas of such habitat which are essential to maintain the viability of the whole. Semi-natural ancient woodland listed on the inventory held by the county statutory conservation agency (the minimum area listing is 2ha). Some smaller areas however, can also be of 'High' value. Historic hedgerows that qualify as biologically important under the Hedgerow Regulations (1997). Any regularly occurring population of a nationally or regionally important or scarce species large enough to be considered significant at a county or larger scale.

Value	Criteria	Examples
Regional	High or medium importance and rarity, local or regional scale, and limited potential for substitution	Regionally important sites with potential for substitution. Locally designated sites – Sites of Interest for Nature Conservation (SINCs) and Local Nature Reserves (LNR's). A viable area of habitat identified in the local or Regional BAP, where it states that all areas of the habitat in question should be protected, (if it has potential for substitution), or is identified as important in this way in the Natural Area Profile. A regularly occurring population of a nationally important species which is not sufficiently large to be considered valuable at county or larger scale. A regularly occurring population of a regionally important species if large enough to be considered significant at the local scale (i.e. between Neighbourhood and District). Any regularly occurring population of a county-important species as identified through e.g. listing in a county "red data book" or BAP, if large enough to be considered significant at this scale.
Local	Low or medium importance and rarity, local scale	Undesignated sites of some local biodiversity interest, including social interest. Viable areas of habitat identified in a sub-County (District/Borough) BAP. Sites/features that are scarce at the sub-County scale or which contribute appreciably to the overall ecological resources at this scale. A diverse and/or ecologically valuable hedgerow network. A viable population of a species listed in the BAP or otherwise judged important at this scale.
Negligible	Very low importance and rarity, local scale	Other sites with little or no local biodiversity interest, including social interest. Plant communities in improved grassland, or well weeded arable land. Isolated species-poor hedgerow fragments. Small areas of non-native planting.

8.4. Baseline conditions

8.4.1. Terrestrial habitats

Semi-improved acid-grassland verges

Along the roadside verges and on either side of the lay-by, located to the north of the existing bridge, are areas of semi-improved acid grassland. The verges most closely resemble NVC community U2 *Deschampsia flexuosa* grassland. They are generally species poor and

somewhat degraded due to grazing and localised pollution effects from road traffic and drainage (Figure 8.1). However, these verges were deemed to provide locally valuable habitat for invertebrates and small mammals and therefore have been attributed **Local** importance.

Wet-heath habitats

Wetland heath is the dominant habitat in the survey area. It is characteristic of NVC community M15 *Scirpus cespitosa – Erica tetralix* wet heath with a typical sub-community. This habitat was found to be of varying quality and has suffered from grazing pressure. Some areas are deemed to be of **Regional** importance (areas west of Ba Bridge) and other areas of **National** importance (areas east of Ba Bridge).

Figure 8.1 Semi-improved acid grassland verges with many species that would not be locally present without the embankment and road.

Bog habitats

Blanket bog is a protected habitat under Annex I of the European Habitats Directive and is a primary qualifying habitat for the Rannoch Moor SAC site selection. There is an area of bog that is considered to be a transition between NVC community M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub community and M20 *Eriophorum vaginatum* blanket and raised mire species poor sub community. However, this community has been degraded due to grazing and past burning. Although currently between M19 and M20 there is potential for recovery to the less degraded M19 community. It has therefore been assessed to be of **Regional** importance.

Other bog habitats present in the study area included NVC community M3 *Eriophorum angustifolum* bog pools and M25 *Molinia caerulea – Potentilla erecta* mire, with *Erica tetralix*

sub-community. Within the study area both of these areas were deemed to have **Regional** importance.

Woodland habitats

There are two small areas of woodland within the study area. The NVC community W4 *Betula pubescens – Molinia caerulea* woodland with the *Sphagnum* sub-community is a small area to the south and east of the bridge and will provide suitable habitat for nesting birds. There was also a small area of willow carr which resembles NVC community W1 *Salix cinerea – Galium palustre* woodland. Both of these habitats were deemed to be important at the **Local** level.

Aquatic habitats

The open water-bodies in the area are oligotrophic to mesotrophic and contain high quality habitat with vegetation typical of nutrient poor conditions. Loch Ba and Lochan na Stainge are part of the Rannoch lochs SPA. Black Throated Divers (*Gavia arctica*) attempt to nest on Loch Ba most years but are often unsuccessful due to disturbance from people fishing on the loch (RSPB, consultation response). These water-bodies have been assessed as having value at the **International** level. The River Ba hosts populations of a protected invertebrate species and is, therefore, deemed to be internationally important. The impact assessment on this species is dealt with in a confidential report written by Jacobs Babtie entitled 'River Ba Protected Freshwater Invertebrate Report'. A further report produced by Scotland TranServ is also included in appendix D.

8.4.2. Fauna

Invertebrates

The site has been assessed as having **International** value due to the presence of an internationally rare species of aquatic invertebrate afforded protection under Annex II of the European Habitats Directive and fully protected under schedule V of the Wildlife and Countryside Act (survey results can be found in Confidential Appendix D).

Fish

Atlantic salmon, sea lamprey, river lamprey and brook lamprey are all listed on Annex II of the Habitats Directive, although they are not qualifying features of Rannoch Moor SAC. Suitable salmonid habitat and food resources are likely to be available within the survey area. It was not deemed necessary to undertake detailed fish surveys because the protected invertebrate species is reliant on salmonids as part of its lifecycle and its presence will afford rigorous mitigation measures that will consequently ensure protection of any fish and associated habitats. The fish community of the River Ba, and nearby lochs, is assessed as being of ecological value at the **International** level.

Reptiles

The habitats within the scheme area provide small extents of largely sub-optimal habitat for common, but protected, reptiles such as viviparous lizard (*Lacerta vivipara*), adder (*Vipera*

berus) and slow worm (*Anguis fragilis*), however, no evidence of their presence was recorded in the surveys. Reptiles, if present in study area, would have value at the L**ocal** level.

Birds

The presence of the Annex II species black-throated divers that nest on Loch Ba makes the area adjacent to Ba Bridge **Internationally** important with respect to breeding birds. Birds which may nest in the patches of woodland will be of value at the **Local** level only.

Mammals

Otters are fully protected under UK and European legislation. Some evidence of otter using this section of the River Ba was found during the survey in August 2007 (Appendix E). One fresh spraint was found immediately south-west of the existing bridge, and its location suggested that individuals may cross the carriageway at this point. There were no holts found during the survey. Otters are common in this part of Highland region and the population within the study area is assessed as forming an integral part of a population which is of value at the R**egional** level. It is likely that otters will cross the road when travelling along the river as there is no otter ledge in the existing bridge. No evidence of water vole was found within the survey area.

Bats

All bats in the UK are fully protected under UK and European legislation. The existing bridge is assessed as having low potential to support bat roosts due to the nature of its construction, namely, a concrete apron and well-pointed joints. No signs of bats were found during the November 2005 survey. During the survey carried out in August 2007 one bat was observed foraging at dusk, indicating that bats may be roosting nearby and using the watercourse for feeding. The River Ba and nearby lochans are likely to support high densities of airborne insects that will provide prey for foraging and commuting bats. The existing bridge is most likely to be of no value to bats as a roosting site, but the surrounding area is assessed to be of some importance to bats, which are, therefore, attributed value at the **Local** level.

Other fauna

No other protected, or otherwise notable, species were recorded, and, given the habitats present, none are considered likely to occur within the survey area.

8.5. Impact assessment

8.5.1. Methodology

The ecological features or resources that are of sufficient value to be included in the assessment were determined based on consultation with relevant statutory bodies and conservation groups, the criteria in Section 8.3, and through surveys to establish baseline conditions (Section 8.4).

The development proposals have been compared with the information gathered on the baseline ecology of the site and surroundings in order to predict the potential ecological impacts which are likely to result from the scheme. The evaluation criteria described below

have been used to consider whether an impact is 'significant', and to assess the significance of residual effects after agreed mitigation measures have been considered.

An ecologically significant impact is defined by IEEM (2006) as 'an impact (negative or positive) on the integrity of a site or ecosystem and/or the conservation status of habitats and species within a given geographical area'. The assessed value of any feature (Section 8.3) that will be significantly affected is then used to identify the geographical scale at which the impact is significant.

The likelihood that a change/activity will occur as predicted, and also the degree of confidence in the assessment of the significance of the impact must also be considered.

Likelihood is based on a four-point scale as follows:

- **Certain/near certain**: probability estimated at 95% chance or higher
- **Probable**: probability estimated above 50% but below 95%
- **Unlikely**: probability estimated above 5% but less than 50%
- **Extremely Unlikely**: probability estimated at less than 5%

Significant impacts on features of ecological importance should be mitigated. Any residual impacts remaining, together with the likelihood of success in mitigation, are the factors that would be considered against legislation, policy and development control in determining the application.

8.6. Potential impacts

This section characterises and predicts the potential impacts from construction and operational phases on ecological features in the absence of any mitigation measures.

Widely recognised potential impacts associated with road schemes on nature conservation have been identified in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, (Table 8.3).

Table 8.3 Potential impacts of road schemes.

Impact	Risks	Impacts in the Ba Bridge Study Area
Direct habitat loss	land take	The proposed works involve the replacement of the existing bridge with a bridge at the same location. The permanent loss of habitats associated with the proposed scheme is likely to be minimal in terms of scale and significance and be restricted to the areas adjacent to the existing carriageway. Construction of the temporary bridge and roadway will result in temporary loss of habitat along this route. In addition, a small area of habitat (approx 5 m^2) would be lost on the west bank of the river where a support

Impact	Risks	Impacts in the Ba Bridge Study Area
		pillar would be required.
Severance or fragmentation of existing habitat areas	smaller areas of land may be more vulnerable to habitat loss, damage or change, and may be unable to support their original number or diversity of species	No additional severance or fragmentation of existing habitat areas is predicted as a result of the proposed scheme, due to the online design of the replacement bridge.
Mortality of animals crossing roads	may cut across their traditional territory or foraging routes	Due to the online design of the replacement bridge, there is not predicted to be a significant change in access level or routing of animals crossing the road.
Hydrological disruption	disruption to drainage pattern or changes in flow and volume of sub-surface water may cause damage to the existing ecology. Resultant impacts can be highly localised or affect habitats some distance away from the scheme	Wetland habitats, including mires, blanket bog and wet heaths are susceptible to impacts from developments that affect the hydrological regimes of those habitats. No permanent impacts will result from the redevelopment due to online design of the replacement bridge. Temporary impacts may result from the construction of a temporary roadway across existing semi-natural habitats to the south west of the existing A82.
Pollution of watercourses	via road drainage, runoff and spray from road traffic	There will be a slight increase in the levels of road run-off as a result of increased area of hard standing. However, because road drainage will now enter the river via a catch pit and swale to the east side of the bridge there will be associated water quality improvements. Traffic levels will not increase as a result of the scheme so the overall level of pollutants will be similar to that which exists currently. During construction, however, run-off of construction materials onto semi-natural habitats may result in adverse impacts to these habitats.
Physical obstructions	caused by road constructions and bridges, particularly to larger animals	No physical obstruction of existing habitat areas is predicted as a result of the proposed scheme, due to the online design of the replacement bridge.
Visual and light pollution caused by road lighting	can affect invertebrates and disorientate birds and mammals	No visual and light pollution impacts are predicted as a result of the proposed scheme, no lighting schemes are proposed in the design of the replacement bridge. During the construction phase use of artificial lighting for night time working has potential to disturb sensitive nocturnal species such as otter and bats.
Air pollution	causes changes in biota and particulates settling on plants can impede photosynthesis	Air pollution is not predicted to be increased during the operation of the replacement bridge. During the construction phase, however, particulate deposition of material arising from construction materials may result in limited impacts close to the construction site.

Impact	Risks	Impacts in the Ba Bridge Study Area
Disturbance during construction	although construction works are temporary, they can still lead to disturbance and pollution if sufficient care is not taken	Disturbance to habitats in the proposed road corridor and in adjacent habitat areas is likely during construction and due to the presence of temporary bridge construction and temporary site compounds. Visual or noise disturbance to species may take the form of increased human activity, machinery and structures during the construction phase. Disturbance may also occur through physical obstructions in the vicinity during construction, light pollution or air pollution. Watercourses may be temporarily affected by disruptions to drainage patterns or pollution.

8.6.1. Potential impacts on key habitats

Due to the online design of the scheme, the majority of habitat impacts will be associated with the construction phase. There will be no significant change to the local environment through the operation of the completed scheme.

Open and running waters

The nearby lochs and the River Ba are evaluated as being of **International** importance. There is a possibility of Loch Ba, Lochan na Stainge and River Ba being indirectly affected by construction due to siltation, spray and runoff. Silt causes permanent damage to fish, invertebrates, insects and plants and build up may cause flooding. Water containing silt should never be pumped or allowed to flow directly into a river, stream or surface water drain.

Concrete and cement are very alkaline and corrosive and runoff can have a highly polluting impact on watercourses. A lay-by off the A82, close to the western tip of the loch and north of the bridge, is under consideration for use as the site compound. Such usage as a site compound or for storage of construction material could potentially result in pollution impacts from run-off and road drainage if material were to be deposited close to the loch side.

There would therefore be a probable negative impact on this habitat. Effects may be reversible in time, once construction was complete. Unmitigated, it is rated **probable** that the habitat could be significantly affected at an international level during the phase of construction work.

It is very **unlikely** that there will be any significant operational impacts at a national level on standing and running waters as a result of this scheme after construction is complete. The new bridge will be located in the same position as the existing structure and because there will be no net change to the flow or volume of traffic, no increase in associated pollution or run-off is expected. Surface water drainage from the new bridge will be diverted to a catch pit and swale to the East side of the bridge before discharging into the river. Existing in-stream structures are remaining *in situ* and will support the new bridge so there will be no change in the hydrological regime of the watercourse.

Semi-improved acid grassland verges along the A82

Semi-improved acid grassland is a local value receptor. Part of the verges consisting of this habitat type will be lost due to construction of the temporary bridge. The lower end of the embankments may avoid major habitat loss but suffer disturbance due to construction, and increased pollution as a result of construction activity, drainage and run-off is probable. Unmitigated, a significant impact at this level is unlikely.

There would therefore be a negative impact on this habitat although the magnitude of this effect would be very small. Effects may be reversible in time, once construction was complete. It is considered unlikely that temporary construction impacts could negatively affect the conservation status of the habitat. As a local value receptor, unmitigated, a significant impact at this level is unlikely.

Wet heath habitats

Wet heath is a receptor of Regional to National value. Only a small amount of certain permanent habitat loss through a small increase in hard standing is anticipated as a result of the scheme. A significant impact at Regional to National level is considered unlikely.

However, construction of the temporary bridge would probably result in a more substantial temporary habitat loss in an environment where recovery is slow. Additionally, the habitat may suffer from physical disturbance due to construction and increased pollution as a result of spray and run-off. Furthermore, the riverside areas of wet heath may be subject to pollution events that affect the river, including hydrological disruption and water-borne particulate pollution.

Effects may however, be reversible in time, once construction was complete. It is considered that temporary construction impacts could negatively affect the conservation status of the habitat. Unmitigated, a significant impact at Regional to National level is probable.

Mire and blanket bog habitats

Mire habitats are widely distributed through the study area, particularly along the river edge and in undulations among the wet heath. They are valued as receptors of Regional importance. There will be no significant permanent loss of habitat and no increased incidents of pollution resulting from the operational phase of the scheme. A significant impact at Regional level is considered unlikely.

Areas of habitat outwith the construction footprint are unlikely to be directly be affected by the proposed development although again could suffer from disturbance due to construction, and increased pollution as a result of construction activity, drainage, spray, particulate deposition and run-off. Additionally, as before, the riverside areas of mire may be subject to pollution events that affect the river, including hydrological disruption and water-borne particulate pollution. Although these mire and bog habitats are ombrotrophic, generally relying on atmospheric precipitation rather than surface drainage, they would be probably be negatively affected by pollution events during construction. Unmitigated, a significant impact at Regional level is probable.

Woodland habitats

Woodland habitats are receptors of Local importance. If the construction of the temporary bridge was to take place on the eastern side of the present bridge, the small area of willow

carr woodland is near certain to be lost. Unmitigated, a significant impact at local level is considered unlikely.

If the proposed temporary bridge is constructed on the west side of the bridge there would be a very small near certain negative impact upon the willow carr and upon the scattered willow and birch due to pollution during construction from particulate deposition and spray. Unmitigated, a significant impact at local level is considered unlikely.

8.6.2. Potential impacts on key species

As with key habitats, the impacts on fauna will be restricted mainly to construction-related effects. There will be no net change to the local environment, nor any increased adverse impacts to fauna through the operation of the completed scheme. Traffic flows and volume are to remain unchanged (Table 5.3) and so there should be no increased mortality resulting from vehicles. Neither will there be any increased pollution risk or deterioration in water quality as a result of the scheme (Sections 7.5 and 10.12). As such, no adverse impacts are predicted on any fauna.

Otter

Due to their protection by international legislation otters are a receptor of International importance. In general, otters could be disturbed indirectly during the construction phase, and directly through pollution incidents, at any time of the year.

Unmitigated construction work may force otters to exit the water on to the carriageway for the duration of the construction phase, due to the presence of the temporary bridge and associated structures and equipment. This may potentially increase the chances of a fatal collision during this period. Water quality is an important factor for otters, and any soil erosion or increased dust or silt loading during the construction phase may temporarily affect fish prey populations. Pollution incidents in watercourses during construction may adversely affect both fish and otter.

Disturbance may also result during the construction phase due to noise, visual and light pollution around the construction site and site compound.

There would therefore be probable negative impact on otter, although, as the density of the local population is not known, the magnitude of this affect is uncertain. Effects would however, will generally be reversible in time, once construction was complete. On a precautionary basis, it is considered possible that temporary construction impacts could negatively affect the conservation status of the local population. A significant impact at International level is probable. Such an impact would be in breach of law, due to the species' protection measures.

During operation, there would not be any increase in mortality rates on the carriageway as both road access and traffic levels would not change from current conditions. No physical barriers would be put in place to alter movements. Light levels would also remain the same, and disturbance levels would be unchanged. Any significant impacts are very unlikely.

Bats

In the national surveys of 2005, a significant positive trend in population size was found for field counts in the majority of bat species, although there was a negative trend for colony

counts of common pipistrelle[1], the species recorded at Ba Bridge. The UK population for the common pipistrelle is approximately 2.4 million, making it the most common and most widespread species. Scotland's population has been estimated at between 0.55 and 0.75 million[2], although there are no regional counts available. There is no evidence however, that the species is particularly rare in the Rannoch Moor area, so bats are considered to be a Local value receptor.

Bats could be disturbed when foraging, or on foraging routes along the watercourse during the construction phase at any time of the year. The temporary bridge and associated structures may create a barrier to regular foraging routes along the watercourse, and adversely affect the ability to capture prey. Any pollution incident or disruption to drainage along watercourses may affect the numbers of insect prey associated with water.

Disturbance may also result during the construction phase due to noise, visual and light pollution around the construction site and site compound during periods of foraging.

There would therefore be a probable small negative impact on bats, although as the local population is not known, the magnitude of this affect is uncertain. Effects would however, generally be reversible in time, once construction was complete. On a precautionary basis, it is considered **unlikely** that temporary construction impacts could significantly affect the conservation status of the local population. Such an impact would be in breach of law, due to the species' protection measures.

It is considered **very unlikely** that there will be any significant operational impacts on bats at Local level as a result of this scheme.

Protected Freshwater Invertebrate

Potential impacts on the Protected Freshwater Invertebrate species are dealt with in Confidential Appendix D, available from Transport Scotland. The invertebrate species is an International value receptor. Unmitigated, it can be assessed that effects from construction are **certain/near certain** to significantly affect the conservation status of the population at international level. The report by Scotland TranServ in Appendix D shows that the current drainage arrangement appears to be causing a significant impact on the species downstream of the bridge, therefore, unmitigated and with no changes to the drainage, operational impacts are **certain/near certain** to create a significant impact.

Breeding birds

A response from RSPB in January 2007 stated that they were unaware of any bird species of particular conservation concern in the Ba Bridge vicinity. Species that may breed in nearby habitat are therefore valuable only at local level. Loss of habitat due to tree removal means that there is potential for a negative effect from the operation of the new bridge, although due to small numbers involved and the ability to relocate, a significant affect at local level is

[1] BCT 2005. *The National Bat Monitoring Programme: Annual Report 2005*. JNCC and Bat Conservation Trust, London. http://www.bats.org.uk/nbmp/documents/nbmpannualreport2005_002.pdf

[2] http://www.snh.org.uk/pdfs/publications/commissioned_reports/F03AC318.pdf

unlikely. During construction, disturbance may occur to disrupt breeding. Again however, low numbers involved means that a significant affect at local level is **unlikely**.

8.6.3. Potential impact on designated areas

Rannoch Moor SAC

There will be no permanent loss of any habitats that are qualifying features of the SAC and so there will be no negative affect on any Annex I habitats. Unmitigated, construction will however have negative impacts on Annex II qualifying species. This means that it is certain/near certain that the proposed development would have an adverse affect on the integrity of the site.

During the operational phase, there will be no net change or increased risk to the SAC as the scheme does not generate and/or redistribute traffic on the A82(T) road. With regard to noise, there will be no net change during the operational phase of the scheme due to there being no change in traffic volume. An adverse affect on the integrity of the site from operations is considered very unlikely.

Rannoch Lochs SPA

It has been confirmed with both SNH and the RSPB that the black-throated Divers do not nest in the vicinity of the bridge. It is also worthwhile noting that disturbance resulting from fishing has prevented successful breeding in the past. Therefore, it is **unlikely** that there will be a significant negative impact on both the conservation status at International level of the divers and the integrity of the SPA as a result of the bridge replacement during construction and **very unlikely** during operation.

Rannoch Moor SSSI

There will be no permanent loss of any habitats that are notified SSSI features during operation, and so it is very unlikely that there will be an adverse impact on the integrity of the Rannoch Moor SSSI from this scheme. The SSSI is cited for its mire habitat, which during construction activities it is rated as probable that this will be significantly affected at this level.

8.6.4. Cumulative impacts

Since there are no other proposed schemes affecting the watercourse at Ba Bridge, the designated sites or within a 30 km radius, no significant cumulative impacts are predicted (see Section 9.5).

8.7. Mitigation

This section details the proposed mitigation measures that will be adopted in order to reduce or prevent potentially significant ecological impacts, as detailed above. This includes measures that have been incorporated at the design stage of the process.

It is important to note that the proposed scheme is a result of an iterative design process and some mitigation measures have been incorporated into its development. For example, the online alignment of the proposed upgrading incorporates mitigation measures to avoid adverse impacts associated with large-scale loss of semi-natural habitats

8.7.1. Design

Alignment

In order to minimise land-take and impacts on surrounding habitats, an online scheme has been selected (i.e. new bridge to be sited in same position as existing bridge). The temporary single-lane bridge that will be used during the construction phase will also be aligned immediately adjacent to the existing bridge in order to minimise land-take and will consist of a single span to avoid the need for any work to be undertaken in the watercourse.

Existing structures

- The use of the existing in-stream piers in the new structure has been selected to minimise the need for any works to be undertaken in the watercourse. In-river working will be restricted to the immediate vicinity of the existing bridge for essential works with no machinery access at this point. No access will be permitted upstream of the bridge in order to safeguard the population of protected freshwater invertebrate species.

Currently otter will have to cross the A82 during high flow therefore, in order to provide environmental benefit, an otter ledge will be incorporated into the design of the new structure..

Drainage

Incorporation of a catch pit and swale, as detailed in the water and drainage section, will significantly improve water quality downstream of the bridge thus providing environmental benefit for the protected freshwater invertebrate, which is currently impacted below the bridge as well as to fish and otter.

8.7.2. Habitat-related mitigation

Permanent loss of habitat will be restricted to small areas immediately adjacent to the existing carriageway. However, additional damage to adjacent habitats will be minimised during construction by adopting best practice construction procedures that limit movements of heavy machinery and restrict access to adjacent areas. In order to avoid significant long-term adverse impacts on the surrounding semi-natural habitat, peatland turf removal, storage and replacement (translocation) strategies will be developed and will include the following steps:

- The turves should be mapped, logged (labelled) and then stored in such order to allow them to be replaced in as close to their original location as possible. To aid this process, photographs should be taken of the site prior to and during the removal of the turfs.

- Turves and blocks should be removed by hand or using a small excavator to maintain the homogeneity and physical structure of the peat and to prevent undue fragmentation.

- Immediately following removal, peat turves and blocks should be kept in storage bags with the vegetated layer on the top and the un-vegetated root matt beneath.

Some of the turves can be stored on areas of the existing damaged peat near the lay-by. The blocks should be kept in storage bags until replaced.

- Watering will be required in order to avoid desiccation of the stored peatland material during periods of no rain or of high temperature.

- There is likely to be some shrinkage in the peat blocks, loss of structure and loss of material, so there may be a need to use locally sourced fill at the base of the excavations before peat blocks are placed back. When transplanting the peat blocks they should be packed as tightly as possible (but without compacting the peat) and layered in horizons according to their physical structure to minimise the impact on the sub-surface peat hydrology. The turves should be replaced according to their labelling to recreate the original mire surface.

- Photographs should be taken at this stage to monitor the regeneration of the area.

- Monitoring of the newly translocated peatland areas should be undertaken for a minimum of 3 years.

- No seed mix should be required using this approach – however if seed mix is to be used then no Perennial Ryegrass (*Lolium perenne*) should be in the mix as this is an alkali-loving plant which will die out over time on the acid-rich substrate leaving a 'scar' on the landscape. Any seed mix to be used will comprise species native to the area and of local provenance where possible.

8.7.3. Species-related Mitigation

Artificial lighting

Night time working will be kept to a minimum in order to prevent disturbance to sensitive nocturnal species such as otter and bat. Any artificial lighting will be very localised, temporary and direct illumination of the River Ba will not occur. Otter fencing will be put in place along the river banks to encourage otters to continue to use the river corridor as a commuting route.

Protected species

It is not anticipated that any protected species will need to be disturbed under licence. However, if the situation arises then appropriate licenses will be sought and monitoring over a prescribed period of time will be undertaken to ensure that mitigation works carried out have been successful and that there is no negative impact on the species.

No birds will be disturbed during the main breeding season (March to August inclusive).

An otter ledge is to be provided in the new scheme which will enable otter to pass safely under the carriageway. The otter population in the area may expand and it is important that otter casualties are minimised. The ledge will be fixed to the existing abutments (which are remaining *in situ*) at a level above the high water mark. In-river working will be restricted to the immediate vicinity of the existing bridge with no access permitted upstream of this in order to safeguard the population of the protected freshwater invertebrate species.

The population of the protected freshwater invertebrate species will be monitored for at least three years post construction to ascertain if the drainage improvements have had any effect on the population as well as to ensure no damage to the population was caused by construction activities.

8.7.4. Best practice

Particular attention will be given to ensuring that risk of pollution entering the watercourse is kept to a minimum (Chapter 7). Appropriate SEPA pollution prevention guidelines will be adhered to at all times and all materials will be stored appropriately to prevent potential for runoff. Ground works will be carried out in favourable weather conditions to minimise potential for siltation of the watercourse. It will be a priority to ensure that any works that pose a risk to the watercourse and the protected invertebrate species within are carried out with extreme caution. Any demolition work will be closely monitored to ensure no debris enters the watercourse.

The contractor will be required to appoint an Experienced Ecologist who will first need to be approved by the Engineer for the Contract. The Contractor's Experienced Ecologist will be responsible for ensuring that all mitigation and best practice measures are adhered to and should be present onsite at key times of construction.

8.7.5. Timing of works with respect to ecological considerations

Bat, otter and water vole surveys are to be conducted prior to construction.

Vegetation clearance timing is primarily dependent on the breeding bird season. Vegetation clearance here will include removal of some scattered trees to the west of Ba Bridge and also peatland turf translocation. The breeding bird season in the UK starts at the end of February until the end of August therefore vegetation clearance and storage could be safely carried out prior to the end of February or at the beginning of September. If site clearance can't be undertaken outwith the bird breeding season, then all vegetation will first have to be checked for breeding birds before removal. If evidence of breeding birds is found then ground clearance must cease until nests have been vacated.

8.8. Significant residual ecological impacts

From Sections 8.6.1 to 8.6.3, the likelihood of there being impacts on the conservation status or integrity of each ecological receptor was assessed, resulting in an evaluation of the likelihood that a significant effect would result from either construction or operation of the site.

Following the implementation of the mitigation measures proposed in section 8.7, it is predicted that all potential adverse impacts can be avoided or minimised. In areas where habitats may be subject to probable significant effects prior to mitigation, adoption of the proposed mitigation measures will result in the likely significance of these impacts being reduced from probable to either unlikely or very unlikely.

Table 8.4 Summary of Impacts, and post-mitigation Residual Impacts on Ecological Receptors

Ecological Receptor	Ecological Importance	Significant Impact (construction phase)	Likelihood of significant impact, unmitigated	Mitigation Measures	Residual Significance and confidence level
Loch Ba, Lochan na Stainge and River Ba	International	Pollution of watercourses hydrological disruption	Probable	Online bridge design with otter ledge Use of original in-stream piers Single-span temp. bridge avoids in-water work	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Semi-improved acid grassland verges along A82	Local	Habitat Loss Pollution (direct and diffuse) hydrological disruption	Unlikely	Crash deck to capture materials before reaching watercourse Turf storage and relocation SEPA Best Practice Guidelines adhered to	**Very Unlikely** to have a negative affect on conservation status; therefore **not significant**
Wet Heath Habitats West of the bridge	Regional	Habitat Loss Pollution (direct and diffuse) hydrological disruption	Probable	Surface run-off via catch-pit and swale instead of straight to watercourse Method Statement agreed with SNH	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Wet Heath Habitats East of the bridge	National	Habitat Loss Pollution (direct and diffuse) hydrological disruption	Probable	The contractor's ecologist will be responsible for developing method statements and the like.	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Mire and Blanket Bog Habitats	Regional	Habitat Loss Pollution (direct and diffuse) hydrological disruption	Probable		**Unlikely** to have a negative affect on conservation status; therefore **not significant**

Ecological Receptor	Ecological Importance	Significant Impact (construction phase)	Likelihood of significant impact, unmitigated	Mitigation Measures	Residual Significance and confidence level
Willow carr and scattered trees	Local	Habitat Loss Pollution (direct and diffuse) hydrological disruption	Unlikely		**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Otter	International	Habitat Loss Mortality on road Hydrological Disruption Pollution of Watercourses Physical Obstructions Visual and Light Pollution Air Pollution	Probable	Online bridge design with otter ledge Use of original in-stream piers Single-span temp. bridge avoids in-water work Crash deck to capture materials before reaching watercourse Turf storage and relocation SEPA Best Practice Guidelines adhered to Surface run-off via catch pit and swale instead of straight to watercourse	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Bats	Local		Unlikely	Method Statement agreed with SNH Night-time working kept to a minimum Pre-construction monitoring Ecological Clerk of Works	**Very Unlikely** to have a negative affect on conservation status; therefore **not significant**
Freshwater Invertebrate Species	International	Appendix D	Certain/near certain	Mostly as above but also monitoring pre, during and post construction	**Unlikely** to have a negative affect on conservation

Ecological Receptor	Ecological Importance	Significant Impact (construction phase)	Likelihood of significant impact, unmitigated	Mitigation Measures	Residual Significance and confidence level
					status; therefore **not significant**
Breeding birds	International	Habitat Loss Disruption during construction	Unlikely	Works to take place outside of breeding season SEPA Best Practice Guidelines adhered to	**Very Unlikely** to have a negative affect on conservation status; therefore **not significant**
Rannoch Moor SAC	International	All of above	Certain/near certain	All of above	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Rannoch Lochs SPA	International	Pollution (direct and diffuse) Disruption during construction	Unlikely	Works to take place outside of breeding season SEPA Best Practice Guidelines adhered to	**Unlikely** to have a negative affect on conservation status; therefore **not significant**
Rannoch Moor SSSI	National	All of above	Probable	All of above	**Unlikely** to have a negative affect on conservation status; therefore **not significant**

9. LANDSCAPE AND VISUAL EFFECTS

This chapter includes the consideration of both landscape and visual issues relating to the proposed Ba Bridge replacement on the A82. Section 9.1 presents the introduction, methods, baseline conditions and predicted impacts relating to landscape and section 9.2 presents the same for visual aspects. As mitigation measures apply to both landscape and visual aspects these are discussed together in section 9.3. Residual landscape and visual impacts are then described in section 9.4 and cumulative effects in section 9.5.

9.1. Landscape

9.1.1. Introduction

This section presents the assessment of the impacts of the bridge replacement, referred to hereafter as the scheme, on the landscape resource of the study area, and considers the changes in the fabric, character and quality of the landscape that are likely to occur as a result of the implementation of the proposals. It is primarily concerned with:

- direct impacts on specific landscape features and elements;
- more subtle effects on the overall pattern of elements which together determine the landscape character and regional/local distinctiveness;
- impacts upon acknowledged special interests or values such as designated landscapes, conservation sites and cultural associations; and
- the effects of any scheme modifications since previous environmental assessments.

9.1.2. Approach and Methods

General Approach

The landscape assessment was undertaken in accordance with The design Manual for Roads and Bridges, (DMRB) (Volume 11, Section 3, Part 5); Landscape and Visual assessment Supplementary Guidance (LVASG) Scottish executive 2002; Guidelines for Landscape and Visual Assessment (GLVIA) Institute of Environmental Management and Assessment 2002 and Environmental Resources Management 1998 Lochaber: landscape character assessment. Scottish Natural Heritage Review No 97.

The four main steps in the landscape assessment process are:

- description;
- classification;
- evaluation; and
- impact assessment.

- In undertaking the landscape assessment, consideration is given to the following:
- Data relating to the components of the landscape, its' character and quality will include reference to baseline information presented in separate chapters of this report (e.g. Ecology and Nature Conservation);
- The value placed on an area is dependant not only on its inherent scenic quality but on its situation, rarity and usage;
- Historical and cultural associations may contribute to the value placed on landscape not generally considered to be of visual or other importance; and
- Landscapes that, although not of a quality to warrant national or regional designation, may be of significant local value.
- Data collection was by way of desk study, consultations and field survey on foot. Since landscape and visual impact assessment are closely related, the data collected have been used for both, as appropriate.

Desk Study

Data collected for other chapters of this report were reviewed to establish the natural elements and processes that contribute to landscape formation. Structure and Local Development Plans were consulted to establish the presence of areas of statutory landscape designation and protection. Current 1:25,000 and 1:10,000 scale as well as historic Ordnance Survey maps were examined.

Data relating to archaeology, ecology, buildings and settlements were reviewed to provide a thorough appreciation of conservation interest. Other human interests were established by analysing data relating to recreation and public rights of way. Information supplied by Scottish Natural Heritage (SNH) has been assessed and used to supplement the desk study data collection. The landscape was then classified into broadly homogeneous units of consistent and recognisable character and quality based on:

- The pattern and scale of landform, land cover and built development;
- Special values including national and local landscape designations, Conservation Areas and historical and cultural associations; and
- Specific potential receptors of landscape and visual impact, including important parts of the landscape, residents, visitors, travellers and other groups of viewers.

Field Survey

The study area for field survey is normally selected as 2km each side of the centreline of the scheme. Although the proposed road and bridge may be visible to a degree beyond this distance, it is considered that any potential landscape effect outside this corridor would not be significant. The term significant in the context of landscape or visual impact in this assessment refers to the level at which the changes to the landscape would be clearly

perceived and mitigation measures considered essential. In this instance the study area has been extended westwards to include the West Highland Way.

In relation to this assessment the study area was visited at various times during 2007 and February 2008 in order to: a) confirm the information obtained during the desk study; b) to gain any additional *in situ* details; c) to assess the Zones of Visual Influence (ZVI's) i.e. identify the area from which the road or traffic may be visible and identify any significant site specific landscape classifications.

Public use of the area was observed during the course of the landscape and visual assessment survey. This can have a direct bearing on landscape as a human resource and is taken into account in the evaluation process.

Impact Assessment Methods: Sensitivity of Landscape Receptors

'Receptor' in this context refers to a landscape element or assemblage of elements that will be directly or indirectly affected by the proposed development. They may include topography, geological or man-made elements, woodland, trees and hedgerows, land use and combinations of elements that create distinctive landscape character.

Evaluation of the sensitivity of receptors to change combines a review of value or importance of the main landscape elements, which together comprise each character area, with their susceptibility to change.

For the purpose of this assessment, landscape value or importance has been defined as "the importance ascribed to the landscape by public perception, value to the community or professional judgement." In this case the public use of the moorland and the road (as observed during the course of the landscape and visual assessment survey) together with professional judgement on landscape quality (see below) was used to ascertain the value of the landscape. The value of the landscape has been classified using the criteria set out within Table 9.1.

Table 9.1 Landscape Value Criteria.

Landscape Value	Criteria
High	A landscape, element or feature of national importance, or of particular importance locally with strong positive character and/or rarity and in particularly good condition.
Medium	An attractive landscape, element or feature in relatively good condition or of regional or particular importance locally.
Low	A landscape, element or feature with few redeeming qualities or negative character and in a poor or degraded condition.

Landscape quality and condition contributes towards the assessment of both value and susceptibility to change and hence landscape sensitivity. The assessment of landscape quality concerns the public perception of aesthetic and visual attractiveness of the landscape, and considers the following:

- Visual factors (proportion, scale, enclosure, texture, colour, views);

- Pattern and composition of features;
- Purity of character;
- Degree of tranquillity; and
- Condition.

'Susceptibility' is equivalent to "vulnerability to degradation" described in DMRB as "the capacity of the landscape to accept change of the type and scale proposed through the introduction of new features or the loss of existing components." In order to evaluate susceptibility the following aspects were considered based on professional judgement:

- Landscape character and context;
- Landscape quality;
- Current and future likely landscape trends;
- The nature and extent of landscape components and their importance and positive or negative contribution to the landscape character area within which they are situated and also to the wider landscape; and
- Rarity.

The criteria used to evaluate the overall landscape sensitivity are outlined within Table 9.2.

Table 9.2 Landscape Sensitivity Criteria

Sensitivity	Criteria
High	Landscape or landscape elements of particular distinctive character, highly valued and considered susceptible to relatively small changes.
Medium	A landscape of moderately valued characteristics considered reasonably tolerant of change.
Low	A landscape of generally low valued characteristics considered potentially tolerant of substantial change.
Negligible	A landscape of low valued characteristics considered tolerant of substantial change.

Impact Assessment Methods: Landscape Magnitude of Change

An evaluation of the magnitude of the proposed changes caused by the scheme was carried out based on a review of the nature and scale of the change, together with its duration and

degree of permanence, using the criteria outlined in Table 9.3. The evaluation of change is based on the existing situation.

Table 9.3 Landscape Magnitude of Change Criteria

Magnitude	*Criteria*
High	Profound change in landscape characteristics over an extensive area to very noticeable change over a more limited area.
Medium	Prominent changes in landscape characteristics over a wide area to less prominent change in a more limited area.
Low	Minor changes in landscape characteristics over a wide area.
Negligible	Minor or virtually imperceptible change in any area or landscape components in a relatively limited area.

Impact Assessment Methods: Significance of Landscape Impact

An initial indication of impact significance (adverse or beneficial) was gained by combining sensitivity and magnitude in accordance with the matrix provided in Table 9.4. Given that the criteria represent levels on a continuum or continuous gradation, professional judgement and awareness of the relative balance of importance between sensitivity and magnitude was also required.

Table 9.4 Significance of Impact

Sensitivity	Magnitude			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major/Moderate	Moderate	Slight
Medium	Major/Moderate	Moderate	Moderate/ Slight	Negligible
Low	Moderate	Moderate/Slight	Slight/Negligible	Negligible
Negligible	Slight	Slight/Negligible	Negligible	Negligible

Impacts of moderate and above are considered significant, as this is the level at which the changes to the landscape would be clearly perceived and mitigation measure considered essential. Impacts below moderate are not considered significant.

9.1.3. Baseline Conditions

Regional Context

The scheme lies approximately 19 km north of Tyndrum and extends for a distance of about 40m. For the purpose of the landscape assessment the study area extends 2 km each side of the length of the scheme. The study area is shown in Figure 4. The A82 provides the strategic road network's southern entrance to the Highlands, providing access to Fort William to the north and Mallaig to the north-west. It caters for both commercial and public traffic travelling between the Highlands and the south, and numerous visitors to the area, including tourists, walkers and climbers, who are attracted by the unique scenery and recreational opportunities of the Western Highlands.

Landscape Policy and Other Statutory Designations

National Policy

National Planning Policy Guidelines (NPPG's) No.1 The Planning System (revised 2000) identifies planning objectives in relation to sustainable development, economy and transport. In common with any other major development proposal, road improvements in areas protected by national designations including Sites of Special Scientific Interest (SSSIs) and National Scenic Areas (NSAs) are subject to the same constraints and to the provisions of development plan policies. Accordingly if a road improvement in a designated area cannot be avoided it should give rise to as little damage to the natural and built and landscape environment as is practicable. In addition, any maintenance, construction or restoration should be carried out to the highest environmental standards.

Ba Bridge is within the Rannoch Lochs Site of Special Scientific Interest (SSSI), the Glen Coe National Scenic Area (NSA) and Rannoch Moor Special Area of Conservation (SAC) and adjacent to the Rannoch Lochs Special Protection Area (SPA) which comprises a cluster of eight oligotrophic lochs centred upon Rannoch Moor shown in Figure 3 (Appendix A).

Highland Structure Plan March 2001

Policy G.2: safeguards against adverse impact on landscape and scenery particularly within designated areas.

Policy N.1: States that new development should seek to minimize their impact on the nature conservation resource and enhance it wherever possible.

Policy L.4: The policy promotes the desirability of maintaining and enhancing present landscape character.

The Lochaber Local Plan

Amenity Woodland 3.6.6 provides protection of development impacting adversely on established woodland and trees important to the landscape, wildlife and amenity.

Scenic Safeguards 3.6.13 seeks to conserve areas of landscape importance including open areas above the tree-line, designated gardens and landscape.

Both the Highland Structure Plan and Lochaber Local Plan endorse the recommendations regarding landscape character proposed in the Scottish Natural Heritage (SNH) Review No.97 Lochaber: Landscape Character Assessment.

Land Use

The study area is managed primarily for game and nature conservation. Water-sports and fishing are prohibited. There are informal tracks from the lay-bys leading eastwards to the boathouse and inland westwards. These tracks are not readily apparent and due to their soft waterlogged condition are only suitable for walkers wearing sturdy waterproof footwear. It is apparent that they are used mostly by travellers who make short impromptu stops at the lay-bys to look at the view, take photographs, a short walk, rest or simply enjoy the atmosphere.

The primary land use of the specific area of the scheme is of course for a road. The A82 was constructed in the 1930s and was the only paved road in the area. Its predecessor, an old military road dating back to the 18th century, is approximately 3 km west of the site outwith the study area. The West Highland Way, an important long-distance Right of Way, converges with this section of the military road.

Land Cover

Rannoch Moor consists of an extensive mosaic of wet and dry heather moorland with areas of rough grassland and bracken. Clumps of rushes and mosses occur in the waterlogged hollows and adjacent to the water bodies and small, dense stands of native downy-birch woodland are present on the islands among the lochans. Further patches of willow scrub and stunted birch and rowan occur adjacent to the road, where the embankments provide a degree of shelter, and randomly elsewhere across the moorland, often in association with the isolated boulders. This poorly-drained low-level plateau supports a rich variety of bog, heathland, peat and nutrient-poor water habitats. The land cover within the study area is typical of the Rannoch Moor vegetation and terrain except that the study area has a proportionately greater area of standing and running water.

Nature Conservation

Details of the nature conservation interests of the study area are set out in Chapter 8, Ecology and Nature Conservation. In the context of landscape the ecological significance of the area is inextricably linked to the dynamics of the landscape and its character.

Landscape Classification, Character and Description

The study area shown on Figure 4 lies within the Blanket Bog Landscape Character Type as defined by Scottish Natural Heritage (SNH) Review No.97 Lochaber: Landscape Character Assessment.

The key characteristics of the Lochaber blanket bog are:

- Vast waterlogged landscape, although one whose scale is reduced by low hanging cloud and mist;
- Amphitheatre setting - a massive basin encircled by curtain of hills which are often accentuated by cloud draped summits;
- Large scale recurring land cover pattern of grass, rush and heather, scattered glacial erratics and mounds, pools and lochans with a few stunted trees;
- Lochans with trees and rocks, provide local foci within the landscape;

- Small scale pattern of seasonal flowers and lichens draw the eye from the expanse into the detail of the bog surface and

- Minimal human influence, giving a wild and remote landscape character.

The Blanket Bog landscape type occurs in only one location in Lochaber, at Rannoch Moor on its eastern edge. It is associated with an intrusion of granite within the Grampian Mountains forming a large basin amidst the surrounding quartzite, schists and volcanic rocks. These resistant rocks form a curtain of hills that frame views across the bog and emphasize the scale of its vast expanse. The high rainfall in the area is retained within the basin causing water logging, pools, lochans and deep layers of peat.

The glacial debris, hummocks, waterlogged ground, remnants of old tree stumps, erosion and coarse vegetation and occasional scrub combine to create a somewhat chaotic appearance. The A82 imposes its character upon the area within which it can be seen or heard.

Like so much Highland scenery this landscape type is strongly affected by both the climate and season; low, gray skies and mists, cold winter winds and rain and a dull, brown sward of heather, grasses, sedges and rushes create a desolate, dramatic character, while summer sunshine illuminates a colourful flora and highlights a craggy backdrop of mountain heights, expanding the scale and uplifting the scene. Clear autumn and winter skies and a low sun can pick out vivid colours and textures and emphasize the stark shadows of snow or frost covered ground.

9.1.4. Landscape Evaluation

This stage of the baseline study involves the evaluation of the value of the existing landscape within the study area in accordance with the criteria in

Table 9.1, which are required in order to assess its sensitivity to change (Table 9.2).

The value of the landscape within the study area is relatively consistent. It is within an area of designated conservation value at the highest national level (SSSI, SAC, NSA). The blanket bog landscape type is locally rare and in good condition. The road and bridge structures themselves without the traffic are virtually unnoticeable from a short distance away and are insignificant in the scale of their surroundings.

Despite the impact of the traffic on the A82 the overwhelming scale of the positive landscape attributes warrant the landscape to be assessed as being of **high value.**

The capacity of this landscape to accept change of the type and scope proposed is assisted by virtue of the scheme consisting of the replacement of an existing landscape element (the bridge and approaches) with a similar profile all contained broadly within the existing road corridor.

The current impact of the traffic will be a constant factor. Notwithstanding the general presumption that small scale changes collectively can cause seriously adverse impacts, it is considered that in this case this landscape could accept change of the type and scale proposed without significantly adverse impact.

This landscape of **high value** considered reasonably tolerant to change is therefore assessed as having **medium/high sensitivity**.

9.1.5. Landscape Impacts

This section describes the potential landscape impacts arising from the proposed scheme before the full beneficial impacts of landscape mitigation. The impacts are described and assessed using the same subject areas adopted within the baseline conditions (section 9.1.3) in order to ensure a systematic and constant approach throughout the assessment process. The same systematic approach is applied to assess predicted visual impacts.

The improvement of an existing road can result in positive (beneficial) and negative (adverse) landscape and visual impacts; these impacts may be temporary, permanent, short or long term. They can be direct, indirect or cumulative and include the following:

Direct

- a change in the landform and land use.
- loss or gain of landscape elements both natural and man-made resulting in:
- a change in landscape patterns, character and sense of place;
- vehicles and/or the road structure, including signs, furniture and lighting, becoming more, or less, apparent in the landscape; and
- a change in noise disturbance and amenity.

Indirect

- the occurrence of new development in the vicinity which is attracted by improved access.
- farm severance causing a change in land use.
- a change in vegetation resulting from changed ground conditions and micro-climate.

Cumulative

- piecemeal loss of landscape elements such as hedges, walls, dykes or other traditional features impacting on regional landscape character.
- the impact of several small scale changes to the road character resulting from relatively small scale schemes such as new signage, visibility improvements or small bridge replacements.
- increased level of adverse impacts due to increased use of the road.
- a change in the way the landscape is experienced.

Scheme description

A detailed description of the proposed scheme is provided in Chapter 3 and illustrated by Figure 1 in Appendix A.

Landscape, Policy and other Statutory Designations

The scheme has been designed in accordance with national policy in relation to unavoidable works within a designated area. The scheme cannot be avoided in this location. Accordingly it has been designed to give rise to as little damage to the natural, built and landscape environment as is practicable. It will be built on virtually the same horizontal and vertical alignment as the existing bridge. The bridge appearance will be simple and relatively insignificant in this large-scale landscape.

The scheme will comply with Highland Structure Plan March 2001 and Lochaber Local Plan in relation to the landscape effects upon landscape character, local amenity and nature conservation in that the landscape design will be in accordance with the Scottish Natural Heritage (SNH) Review No.97 Lochaber: Landscape Character Assessment and Scottish Executive's landscape design and management policy, 'Cost Effective Landscape: Learning from Nature'. This policy requires road development to be properly related to and integrated with local landscape character, to take opportunities to enhance local biodiversity and respect local amenity.

In relation to Landscape, Policy and other Statutory Designations the scheme would result in a direct impact causing minor changes in landscape characteristics over a limited area. The magnitude of change would therefore be negligible adverse and the significance of impact **slight adverse.**

Land Use

The scheme would cause little or no significant change to the existing land use in that the scheme will replace an existing bridge in the same place. The only disturbance would be to accommodate the site offices in the lay-by, possibly impinging slightly on to adjacent land, and to provide the temporary road diversion during the period of the works. In each case the surface vegetation will be taken up, stored and replaced to reinstate the area to its former condition. In the case of the area next to the lay-by it is envisaged that the reinstatement will be an improvement to that which currently exists in that the area has been despoiled by unauthorized tipping.

The landscape magnitude of impact caused by any change in land use would be negligible. The significance of impact will be **slight adverse**.

Land Cover

The scheme would have little impact on any noteworthy vegetative landscape elements for the same reason as above.

The landscape magnitude of impact caused by any change in land cover will be **negligible adverse**. The significance of impact would be **slight adverse.**

Nature Conservation

In accordance with the predicted impacts on nature conservation set out in Chapter 8 of this document the magnitude of change in landscape character would be negligible. The significance of impact would therefore be **slight adverse.**

Landscape classification, Character and Description

The significance of adverse impact predicted in relation to land use, land cover and nature conservation is in each case slight. Having in mind the existing adverse impact of the traffic on the landscape character in the vicinity of the scheme the magnitude of change would be negligible.

The significance of impact would therefore be **slight adverse.**

9.2. Visual Effects

9.2.1. Introduction

This chapter presents the predicted impacts of the proposed scheme on the views and visual amenity within the study area. Visual amenity is defined as the pleasantness of the view or outlook from an identified receptor or group of receptors.

The assessment determines the degree of change to the views and visual amenity that will occur as a result of the proposed scheme to and from buildings, areas of public open space and footpaths. The buildings, open spaces, roads and footpaths that would have views of the road development are collectively referred to as 'receptors'. The potential to mitigate adverse impacts has been taken into account in the assessment and the residual impacts identified.

9.3. Approach and Methods

This assessment was undertaken in accordance with DMRB (Volume 11, Section 3, Part 5) with reference to the following documents:

- 'Landscape & Visual Assessment Supplementary Guidance (LVASG) (Scottish Executive; 2002);
- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA) (Institute of Environmental Management and Assessment; IEMA;2002); and
- Planning Advice Note (PAN) 58; Environmental Impact Assessment (Scottish Executive 1999).

The following data sources were also used in the visual assessment:

- scheme proposal drawings, previous reports and assessments; and
- the field survey undertaken as part of the landscape character assessment supplemented by further field study to identify the impacts and inter-visibility between the proposed road and buildings, public open space, including roads and footpaths.

It is accepted good practise to prepare a Visual Envelope Map (VEM) following the field survey to determine the area of land from which a view of any part of the scheme, including its structure could be seen. This area is referred to as the Zone of Visual Influence (ZVI). The impact on the views from potential receptors within this ZVI are then assessed and presented and shown in the Visual Impact Tables and included as Appendix H.

In this situation where the scheme consists of replacing a relatively small and insignificant landscape element within a large scale landscape it was not considered to be necessary nor critical to make an accurate assessment of the visual envelope. The difficulty in preparing an accurate assessment being that the study area consists of numerous hillocks, hollows and large erratics which obscure views of the scheme when viewed from various aspects. Although there are informal tracks leading from the lay-bys as described in paragraph 9.1.3.3 Land Use, the area is relatively inaccessible and attracts little public access. Visual assessments have been made from recognisable visual receptors and detailed in the Visual Impact Table.

9.3.1. Assessment of Visual Impacts

In order to assess the significance of any impacts, the sensitivity to change of the receptors and the likely magnitude of change were considered as outlined below.

Sensitivity of the Visual Receptors/Viewpoints

The sensitivity of the visual receptors/viewpoints was assessed by evaluation of a range of factors, including:

- the nature and context of the viewpoints;
- an assessment of the expectations of users/receptors;
- the importance and value of the landscape in the view; and
- the nature of the existing view.

'Importance' in the context of 'landscape in the view' relates to the aspect of the building or viewpoint in relation to the view. 'Value' in the context to 'landscape in the view' relates to the degree of visual amenity of the view. In the case of roads and footpaths, the type of users and degree of usage is taken into consideration, with business/commercial traffic being less sensitive than visitor/leisure traffic. The criteria used to determine the sensitivity of the receptors to the proposed changes are shown in

Table 9.5 below.

Table 9.5 Sensitivity of receptors to visual change

Sensitivity	Criteria
High	Where the landscape in the view is considered to be of high value and importance to the receptor and any change would be noticeable and would affect visual amenity. e.g. residential properties with good open

	views/footpaths
Medium	Receptors where the landscape in the view is not perceived as a primary factor and not crucial to their visual amenity. e.g. residential properties, sporting / recreational facilities
Low	Receptors where the landscape in the view is relatively unimportant/irrelevant and/or the receptors are not particularly sensitive changes in the appearance of the landscape. e.g. Industry/places of work
Negligible	Receptors where the view has little or no impact. e.g. because of distance or it being obscured in some way.

Magnitude of Visual Change

The assessment of magnitude of change includes the consideration of the likely effects of the change in the landscape on the views and visual amenity, taking into consideration the scale of the change to the landscape, the addition or loss of landscape elements, the change in landscape character and the amount/extent of the view affected.

The main elements of magnitude evaluation include:

- the extent of the receptors view affected by the development as a proportion of the view available;
- the distance of the receptor from the changed landscape;
- the angle of the view relative to the main activity of the receptor;
- the level of integration or contrast created by the road, the traffic on the road and its associated elements within the view; and
- the potential for effective mitigation of adverse impacts and opportunities for landscape enhancement.

The criteria used to determine magnitude of changes are shown in Table 9.6.

Table 9.6 Magnitude of Visual Change Criteria

Magnitude	Criteria
High	The scheme dominates the view and fundamentally changes its character and components.
Medium	The scheme is prominent in the view, affecting its character and altering some of its components and features.
Low	The scheme is a relatively minor element of the overall view and likely to be scarcely appreciated by a casual observer.
Negligible	The changes are minor or virtually imperceptible.

Significance of Impact

The significance of impact (adverse or beneficial) was determined using a matrix of sensitivity and magnitude, as shown in Table 9.7. As with consideration of landscape impact significance, professional judgement and experience was used to confirm the assessment of significance taking into account that the criteria represents levels on a continuum or continuous gradation depending on the relative importance of sensitivity and magnitude.

Table 9.7 Significance of Visual Impact Assessment

Sensitivity	Magnitude			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major/Moderate	Moderate	Slight
Medium	Major/Moderate	Moderate	Moderate/ Slight	Negligible
Low	Moderate	Moderate/Slight	Slight/Negligible	Negligible
Negligible	Slight	Slight/Negligible	Negligible	Negligible

For the purpose of this assessment impacts of moderate or greater are considered to be significant, as this is the level at which changes would be dearly perceived and mitigation measures considered essential to ensure that the scheme is properly integrated into and related to its setting.

Visual Evaluation

The 'Guidelines for Landscape and Visual Impact Assessment' (IEMA; 2002) state that 'landscape and visual assessments are separate although linked procedures'. The landscape baseline information, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies.

Accordingly the baseline landscape information has been used in assessing the visual impacts. Further evaluation of visual impacts is considered in Chapter 10 'Disruption due to construction'.

Property

There are no residential properties in the study area. There is one building, a boat house, which is a simple shelter for small boats facing due east approximately 220m from the scheme. The building has no windows. It is facing directly away from the scheme and has no facilities within for anything other than boats. It has consequently not been assessed as a significant visual receptor.

Visual Receptor 1 (VR1) The A82

The section of A82 within the study area is relatively straight and level. The distant skyline of mountains beyond the study area boundary dominates the visual attraction from the road. The fore and middle ground are generally subservient from a visual standpoint. The bridge itself is not a prominent element in the landscape, especially from the vehicle travellers' perspective bearing in mind that the majority of vehicles are travelling at high speed through the study area. The replacement bridge will be slightly more prominent than the existing structure in that the parapets will be formed from a single tubular steel rail above a low concrete structure as opposed to the existing weathered stone. The scheme would also require a small amount of grassland, willow scrub and birch trees to be removed to make way for the temporary road and slight widening of the embankments where the scheme joins the existing road. This would appear as a noticeable scar in the landscape.

It is considered that the view from the A82 (VR1) is of high value and importance and that any change would be noticeable and would affect the viewers' visual amenity. For this reason it has been assessed as having a **high sensitivity** to change.

The difference in appearance and prominence of the new bridge would be relatively minor in the overall view. The magnitude of visual change would consequently be **low adverse** and the significance of visual impact **moderate adverse.**

Visual Receptor 2 (VR2) The lay-bys

There are two lay-bys virtually opposite each other approximately 150m north of the bridge. They are used mostly by travellers who make short impromptu stops to look at the view, take photographs, a short walk, rest or simply to enjoy the atmosphere. As the lay-bys are in line with the bridge the only view of the bridge from this aspect is the end view of the parapets. The vast majority of the vision from the lay-bys is unaffected by the scheme.

It is considered that the view from the lay-bys is of high value and importance and that noticeably adverse change would affect the viewers' visual amenity. For this reason it has been assessed as having a **high sensitivity** to change.

The difference in appearance and prominence of the new bridge would be almost imperceptible in the overall view. The magnitude of visual change would consequently be **negligible adverse** and the significance of visual impact **slight adverse**.

Visual Receptor 3 (VR3) Pedestrians

Currently there is no formal footpath along the A82 in the study area. The scheme will make provision for a footpath across the bridge. There are informal tracks from the lay-bys leading eastwards to the boathouse and inland westwards. These tracks are not readily apparent and due to their soft waterlogged condition do not attract pedestrians to venture far or for long. A high proportion of the study area is covered by open water restricting pedestrian access. Views of the scheme from these tracks diminish noticeably within relatively short distances due to the grand scale of the landscape and relatively minor scale of the bridge. From five hundred metres away the road and bridge with no traffic on it becomes almost imperceptible. It is considered that the view from a pedestrian's standpoint is of high value and importance. The tracks and informal access to the surrounding area can therefore be assessed as having a **high sensitivity** to change.

The difference in appearance and prominence of the new bridge from these tracks would be for the most part minor becoming negligible with increase in distance as the bridge blends into the background. The magnitude of visual change would consequently be **negligible adverse** and the significance of visual impact **slight adverse.**

Visual Receptor 4 (VR4) The West Highland Way

The West Highland Way is approximately 3km west of the scheme. From this distance the existing bridge is not discernable let alone any changes proposed by the scheme. It has consequently not been assessed as a significant visual receptor.

9.4. Landscape Mitigation

9.4.1. Introduction

Mitigation of adverse impacts associated with construction of this new road is an iterative process involving a combination of three approaches:

- Prevention of adverse effects at source – e.g. alignment in cutting to prevent unacceptable levels of visual intrusion or such that it avoids any direct impact on designated landscape areas.

- Reduction of adverse impacts that cannot be eliminated by prevention – e.g. environmental barriers, landscape planting design including woodland planting, hedges and tree planting, replacing hedges and other landscape elements.

- The provision of alternative or compensatory measures where appropriate and feasible e.g. the creation of new habitats, contributions to local biodiversity and the wellbeing of local wildlife.

Landscape and visual factors are closely related. The mitigation measures described in this section consequently relate to both landscape and visual impacts.

The landscape design and mitigation objective is to ensure that the completed scheme is properly integrated into and related to its setting having in mind the character of the area and its biological importance.

To achieve this, the following aspects of the bridge improvement design have been considered:

- horizontal and vertical road alignment to achieve best fit with the tie in to the existing carriageway;
- retention and best use of existing vegetation;
- minimising damage to landscape elements; and
- minimising damage to sites of ecological importance.

Landscape planting design, earth moulding and conservation of wildlife and biodiversity enhancement have been and will continue to be considered and developed during the detailed design of the scheme in the effort to reduce impacts and where appropriate take the opportunity to enhance amenity and landscape character.

9.4.2. Landscape Design

The procedure set out in the Scottish Executive landscape design and management policy 'Cost Effective Landscaping: Learning from Nature' (CEL:LfN) and the principles of landscape design detailed in DMRB (Volume 10) have been followed in order to ensure that all mitigation measures are effective, represent best value for money and make a positive and sustainable contribution to the character and bio-diversity of the landscape.

The principal landscape issue to be addressed on this scheme is to ensure that the scheme is properly integrated into and related to its setting especially in relation to the ecological and scenic importance of the landscape and the tourist interests of the road users.

The design strategy to achieve this is derived from the following considerations:

- appropriate choice of alignment and the new bridge in order to minimise disturbance to moorland vegetation, patches of willow scrub and individual birch and rowan adjacent to the bridge;
- a design has been selected to minimise the bridge profile by reducing the height of piers and abutments and creation of a bridge deck that fulfils the functional and safety requirements of the replacement scheme and minimises the extent of additional land-take to cater for temporary works and increased width of replacement bridge deck and other structural elements;
- use of steel girders, which will weather within a few months to give the appearance of a slightly textured, typically deep brown/ purplish colour, for improved integration with the surroundings;
- partial retention of existing stone piers and stone facing to new concrete abutments, to minimise adverse visual effects;
- careful removal, storage and translocation of existing turfs onto verges and on soft cutting and embankment slopes, to assist in slope stabilisation and rapid re-establishment of vegetation on disturbed soil areas;

- reinstatement of earthworks to achieve a finished appearance that reflects the natural landforms in the locality and sensitively integrates with the surrounding topography, avoiding even and regular cuttings and embankments and grading out tops and bottoms of slopes to avoid sharp angles; and

- compliance with SNH's consultation response, which requires a method statement, set of principles and landscape restoration plan to ensure that the desired end result for the replacement bridge, topsoil reinstatement and re-establishment of vegetation is achieved.

The successful integration of the scheme into the landscape will depend to a large extent on the re-establishment of semi-natural vegetation over temporarily disturbed areas and verges. The success of semi-natural turf translocation and natural regeneration is dependent on a number of factors including weather, soil conditions, the existence of undesirable seed and the presence of a semi-natural seed bank. Monitoring will therefore be advisable during the growing season after completion of the works and thereafter annually until successful establishment has occurred to assess establishment and identify any special remedial or management measures that may be required.

9.5. Residual impacts

9.5.1. Introduction

The landscape and visual impacts of the proposed scheme have been assessed as envisaged on a winters' day after opening before mitigation measures take effect. The residual impacts predict the situation on a day in summer 15 years after opening.

9.5.2. Landscape

It is anticipated that reinstatement of the earthworks and indigenous vegetation will make a rapid and progressive contribution to properly integrating the works into its setting. Natural regeneration of herbaceous growth and scrub will develop progressively, especially in close proximity to the retaining walls due to the shelter they provide. The latter will help to bond a close relationship between the built structure and natural landscape. The replacement bridge and parapet will naturally discolour progressively losing its new appearance and also develop a sense of unity with the road itself. It will be seen as an unobtrusive and necessary functional element in the landscape and recognised as a bridge of its time in the same way as has the existing bridge.

It is anticipated that the significance of impact on the landscape will reduce from generally **slight adverse** at the year of opening to **negligible adverse** fifteen years hence.

9.5.3. Visual Receptors 1, 2, 3, and 4

The difference of the view from the visual receptors (VR1 A82, VR2 Lay-by, VR3 Pedestrians and VR4 The West Highland Way) fifteen years after construction will be negligible due to the reinstatement of the landscape disturbance caused by the works and the weathered appearance of the small scale bridge in the large scale landscape.

The residual significance of visual impact would therefore be **negligible adverse.**

9.6. Cumulative effects

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the road development in conjunction with other developments (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may affect the way in which the landscape is experienced and can be beneficial or adverse.

The initial programme for the replacement of seven bridges in Rannoch Moor and Glen Coe was identified in the Environmental Scoping Study produced in 2003 as providing potential for cumulative landscape impacts. The main concerns expressed by consultees at this stage were regarding the finished appearance of the bridges and the perceived need for consistency in their final design. These comments have been addressed and the scheme designed accordingly. A consistent approach to the design and finish of the replacement bridges in Rannoch Moor and Glen Coe is being adopted, with the provision of similar elements including concrete parapets with tubular rail, concrete abutments faced with stone from the existing bridges, steel girders, which will weather to achieve maximum integration with the surroundings and granite flag paved footways on either side of the bridge deck.

The landscape impacts of the individual schemes have been and will be assessed individually in accordance with their setting in the landscape. In each case they will be seen as subservient landscape elements, visual amenity given high priority in structural design and reinstatement of any disturbance completed to the highest standards of design and workmanship. The cumulative impact on the Lochaber and Glencoe section of the A82 of this bridge replacement programme is assessed as being **negligible adverse.**

Disturbance during construction is inevitable but in these sensitive locations particular attention has and will be given to minimise this disturbance. The scale of the works in these large scale landscape settings is relatively small, for a limited period, several miles and years apart and confined to the immediate road corridor where noise, and visual disturbance caused by vehicles is the norm. In this context the cumulative impact on the Lochaber and Glencoe section of the A82 landscape during construction will be **slight adverse.**

10. DISRUPTION DUE TO CONSTRUCTION

10.1. Introduction

This section examines how the construction of the Ba Bridge replacement on the A82 in Rannoch Moor will affect land use, geology and soils, road drainage and the water environment, landscape, cultural heritage, ecology and nature conservation, and pedestrians, others and community effects within the vicinity of the scheme. The study area for consideration of construction effects is 100 m around the footprint of the scheme.

10.2. Methods

This section has been prepared in general accordance with the principles and techniques outlined in 'The Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 3 – Disruption Due to Construction'. The aims of this section are to: (1) identify possible disruption to the surrounding environment caused by construction associated with the range of activities carried out between the start of pre-construction works and the end of the contract maintenance period; (2) specifically identify the number of properties, and any sensitive ecological and archaeological features within a fluid 100 m perimeter of the scheme; (3) identify construction operations that could have a particularly significant impact and the extent of potential impacts; estimate the likely quantities of surplus material and borrow associated with the scheme; and (5) detail any mitigation measures proposed to counter any possible negative effects associated with construction activities.

Impact significance is determined using the standard four-point assessment system adopted throughout the ES. Baseline conditions for all aspects considered below are discussed in the appropriate Chapters of the report. The assessments were based on a field visit, desk study of relevant plans, maps and documents supported by appropriate consultation.

10.3. Construction processes and methods

The likely range, magnitude and significance of potential effects can be determined through an understanding of the construction process, period and timescales (See Chapter 3). In addition to specific mitigation measures, the potential impacts of the proposed scheme will be managed through the development and implementation of a construction environmental management plan (CEMP). The contractor will be required to produce and implement a CEMP prior to the commencement of work on site and implement all the mitigation measures identified in the Environmental Statement.

10.4. Air quality

The construction phase of the proposed road scheme will contribute to local emissions of dust and air pollutants. The main sources of anticipated impacts on air quality are likely to be dust generated by placement and excavation of materials and other ground disturbance activities, as well as exhaust emissions from equipment and vehicles.

All construction-related emissions will be temporary, vary temporally depending on the type of work being undertaken, and be confined to the site with the exception of vehicles transporting material to and from the site.

Dust is likely to be generated as a result of the following:

- Site preparation;
- construction of the temporary bridge;
- demolition of the existing Ba Bridge;
- construction of the new Ba Bridge; and
- landscape restoration works.

At this site, dust will only be a potential impact on the ecology of the area and the local watercourses and water bodies because there are no residents within 5 km of the site.

The contractor will be required to employ proactive working methods to minimise dust creation by ensuring all workers are aware of the possibility for dust nuisance, the conditions likely to result in dust nuisance and the measures required to avoid or minimise dust nuisance.

Mitigation to avoid, minimise and control the generation of airborne dust will be adopted by the Contractor in a Method Statement. This will include:

- avoiding unnecessary stockpiling of bulk materials that are likely to be subject to wind-blow. Where stockpiling is necessary materials should be covered;
- placing stockpiled materials away from potentially sensitive receptors, which include areas of peat, vegetation and the River Ba;
- maintaining site and public roads by providing wheel washes to minimise the accumulation of mud on road surfaces;
- minimising drop heights during the handling of bulk materials;
- undertaking regular vehicle maintenance to ensure that emissions of soot and other pollutants in vehicle exhausts are minimised;
- switching off machinery and vehicles not in use;
- watering exposed soil surfaces (during drying conditions);
- covering trucks transporting dust-producing material leaving or entering the construction site; and
- conforming to all relevant local authority requirements or restrictions for dust generation during construction.

Provided that all of the above mitigation measures are implemented, it is unlikely that there will be any significant dust issues as a result of the construction process.

10.5. Cultural Heritage

Both Highland Council and Historic Scotland have said that there are no known cultural heritage or archaeological interests within the vicinity of the bridge. Furthermore, unrecorded archaeological features are unlikely to be found on site because the area would have been heavily disturbed during the original construction of the A82 and Ba Bridge. A search of the RCAHMS database revealed no cultural heritage interests within the area.

Should unanticipated archaeological artefacts/remains be encountered during construction, they should be dealt with in accordance with procedures set out in 'Special Requirements in Relation to Historic Scotland' and agreed with Historic Scotland, Scottish Natural Heritage and the Scottish Executive. A trained archaeologist will be called in if artefacts are believed to have been uncovered.

The assessment of the residual impacts upon cultural heritage during the construction phase of the scheme can be assessed as negligible and insignificant.

10.6. Ecology and Nature Conservation

This section summarises the general ecological impacts on sensitive receptors that may potentially result from the construction of the scheme if mitigation were not to be implemented, and the mitigation required to minimise these impacts.

10.6.1. Potential impacts on key habitats

Open and running waters

There is potential for the watercourse and nearby standing waters to be impacted as a result of siltation and runoff associated with construction and storage of materials. A lay-by off the A82 and to the north of the bridge passes close to the western tip of the loch and is likely to be used as a site compound or for storage of construction material. This could potentially result in pollution impacts from runoff.

The demolition of the existing bridge may result in debris entering the watercourse. This would have a Medium Negative impact upon a habitat with International importance in terms of it supporting a protected species of freshwater invertebrate and as such is assessed as being a potentially Major Adverse impact.

Semi-improved acid grassland verges along the A82

Part of the verges will be lost due to construction of the temporary bridge. This is a Medium Negative impact upon a Local value receptor. Significance of the impact is therefore Minor. The lower end of the embankments should avoid major habitat loss but may suffer disturbance and increased pollution due to construction. This is assessed as a Low Negative impact upon a receptor of Local value. The significance of the impact is therefore assessed as being Minor.

Wet heath habitats

There may be some physical disturbance due to construction and increased pollution as a result of spray and runoff. Furthermore, the riverside areas of wet heath may be subject to pollution events that affect the river, including hydrological disruption and water-borne particulate pollution. This is a Medium Negative impact upon a Regional to Nationally valuable habitat and is considered to be Moderate to Major adverse. Therefore, the overall significance of the potential construction impacts of the proposed scheme on wet heath habitats are assessed as being Moderate to Major.

Mire and blanket bog habitats

Mire habitats are widely distributed through the study area, along the river edge and in undulations among the wet heath. Additionally, as before, the riverside areas of mire may be subject to pollution events that affect the river, including hydrological disruption and water-borne particulate pollution. Although these mire and bog habitats are ombrotrophic, generally relying on atmospheric precipitation rather than surface drainage, they would be potentially affected by pollution events during construction. Therefore, the overall impacts of the proposed scheme are assessed as being of Medium Negative magnitude upon receptors of Regional importance. The significance of the impact on mire and blanket bog habitats is therefore deemed to be of Moderate significance.

Woodland habitats

If the construction of the temporary bridge was to take place on the eastern side of the present bridge, the area of woodland may be lost. This is a Medium Negative impact upon a receptor of Local value resulting in a Minor adverse impact. If the proposed temporary bridge is constructed on the west side of the bridge some willow may be lost and a Low Negative impact upon the scattered willow and birch due to pollution during construction from particulate deposition and spray. This would result in an impact of Minor significance.

10.6.2. Potential impacts on key species

Otters

Otters may be disturbed indirectly during construction through noise and obstruction to their free passage, and directly through pollution incidences. These impacts would be High Negative on an Internationally important receptor and, therefore, assessed to be of Major significance. However, no otter holts or resting sites were identified within the footprint of the scheme so it is unlikely that otters will be disturbed or that a licence will be required. Further pre-construction surveys will be undertaken to ensure this is still the case.

Invertebrates

There is potential for runoff and pollution associated with construction and storage of materials to enter the watercourse. This could have a High Negative impact on the internationally important protected invertebrate species and is, therefore, assessed to be of Major significance.

Birds

It has been confirmed with both SNH and the RSPB that the Black Throated Divers do not nest in the vicinity of the bridge. It is also worthwhile noting that disturbance resulting from fishing has prevented successful breeding in the past. Therefore, it is unlikely that there will be any negative impact on the population as a result of the bridge replacement.

10.6.3. Potential impact on designated areas

Rannoch Moor SAC

There will be no permanent loss of any habitats that are qualifying features of the SAC. With regard to noise, there will be no net change during the operational phase of the scheme due to there being no change in traffic volume; it was for this reason that this element was scoped-out of the assessment.

It is concluded that there will not be a significant effect on the integrity of the SAC from this scheme either during construction or subsequent operation. Therefore, an appropriate assessment is not required under Regulation 48(1) of the Habitats Regulations. This conclusion has been confirmed through consultation with SNH.

Rannoch Moor SSSI

There will be no negative impact on the integrity of the Rannoch Moor SSSI resulting from this scheme either during construction or subsequent operation.

Rannoch Lochs SPA

As mentioned in the section on birds, above, there will be no impact on the Black Throated Diver population and, therefore, the integrity of the SPA will not be affected.

10.6.4. Fauna-related mitigation

Artificial lighting

Night time working will be kept to a minimum in order to prevent disturbance to sensitive nocturnal species such as otter and bat. Any artificial lighting will be very localised, temporary and direct illumination of the River Ba will not occur. Otter fencing will be put in place along the river banks to encourage otters to continue to use the river corridor as a commuting route.

The contractor will be permitted to work within normal construction hours from 0700 hours to 1900 hours during summer months and may be less in winter, seven days a week. If a road closure is required, the work associated with it will take place over night in order to minimise the time required for the closure.

Protected species

It is not anticipated that any protected species will need to be disturbed under licence. However, if the situation arises following pre-construction surveys, then appropriate licenses will be sought by the contractor and monitoring over a prescribed period of time will be undertaken by the ecological specialist and clerk of works to ensure that mitigation works carried out have been successful and that there is no negative impact on the species.

No birds will be disturbed during the breeding season.

Best practice

Particular attention will be given to ensuring that risk of pollution entering the watercourse is kept to a minimum. Appropriate SEPA pollution prevention guidelines will be adhered to at all times and all materials will be stored appropriately to prevent potential for run off. Ground works will be carried out in favourable weather conditions to minimise potential for siltation of the watercourse. It will be a priority to ensure that any works that pose a risk to the watercourse and the protected invertebrate species within are carried out with extreme caution. Any demolition work will be closely monitored to ensure no debris enters the watercourse.

The Contractor's Experienced Ecologist will be appointed to ensure these best practice measures are adhered to and will be present onsite at key times of construction.

10.6.5. Timing of works with respect to ecological considerations

Bat, otter and water vole surveys are to be conducted prior to construction and the results will be used to determine whether protected species licences will be required.

Vegetation clearance timing is primarily dependent on the breeding bird season. Vegetation clearance here will include removal of some scattered trees to the west of Ba Bridge and also peatland turf translocation. The bird breeding season in the UK begins in March and continues until the end of August. Therefore vegetation clearance will be carried out prior to the end of February or at the beginning of September. No vegetation clearance is to be undertaken during the bird breeding season without first consulting a qualified ecologist.

If site clearance can't be undertaken outwith the bird breeding season, then all vegetation will first have to be checked for breeding birds before removal. If evidence of breeding birds is found then ground clearance must cease until nests have been vacated.

10.7. Landscape & Visual Effects

The construction impacts that may impact on the landscape and the visual appearance of the area include:

- erection, operation and removal of site compound with loss of car parking at lay-by due to the contractor's offices and traffic management;
- excavation to accommodate reinforced abutments;
- ground preparation, including crane hard standings, foundation blocks for temporary bridge, construction, operation and removal of temporary bridge, with associated traffic management and signage;
- storage area;
- alteration of existing bridge supports and removal of existing Ba Bridge deck;
- re-construction of replacement bridge; and

- reinstatement of ground disturbed by temporary works.

Consequently there will be:

- disturbance to the tranquil character of the area by the presence and activities of major construction plant and workforce;
- detraction from the scenic beauty of the area;
- loss of a small area of roadside mire, heath, peat and drift deposits; and
- potential pollution of the River Ba and Loch Ba, which could result in discolouration of the water and death of aquatic vegetation, both of which will change the visual appearance of the area.

During construction, for travellers on the A82 and from the lay-by approximately 150 metres north of the bridge, where tourists and walkers stop briefly to enjoy the views across Rannoch Moor before continuing north to Glen Coe and beyond, views towards Ba Bridge will be dominated by a construction site, with cabins, cranes, construction materials and a labour force. Further adverse impacts will result from the traffic management required to divert traffic across the temporary bridge, with traffic lights, signage and traffic delays. The magnitude of change is predicted to be high and the temporary adverse visual impact during this phase is anticipated to be severe.

For the infrequent users of the moorland around the bridge, the views to Ba Bridge will be dominated by demolition and construction activities, machinery, materials and personnel. The traffic management associated with use of the temporary bridge and associated traffic lights and traffic delays will also be highly visible and there will also be close views of disturbed ground at the temporary bridge piers and tie-in. The magnitude of change is predicted to be high and the temporary adverse visual impact during this phase is anticipated to be severe.

Distant views of the construction site, temporary bridge, demolition and construction works and traffic management at Ba Bridge will be seen from the West Highland Way. The magnitude of change is predicted to be medium and the temporary adverse visual impact during this phase is anticipated to be substantial/moderate.

In order to minimise potential pollution and unsightliness of the construction process, the following mitigation measures will be adopted:

- arrest drainage from the site during site clearance, construction and post construction (in accordance with SEPA regulations) in order to ensure that there is no pollution to watercourses, including River Ba/Loch Ba and containment of sediment within surface-water runoff to prevent sediment entering the above water bodies, which may affect the visual appearance of these environmental elements;
- provision of a crash deck or similar structure to protect the River Ba from construction materials and debris which would cause a visual impact;
- site compound and works area are to kept in a tidy condition to minimise visual impact;

- all construction material arising from site clearance works is to be removed from the site and disposed of at an official landfill site or recycled in order to minimise visual impact; and

- imported materials are to be approved with regard to potential damage at the source of extraction or potential damage to the integrity of the existing site, both visually and ecologically.

10.8. Land Use

There will be a very small amount of peatland/moorland required to site the temporary bridge and works during construction; the exact quantities are as yet unknown. There will be no disturbance to land used by the community or land designated for development.

In order to reduce the construction phase land-use impacts, the Contractor will be required to provide the following mitigation measures:

- minimise the area of temporary land-take and the duration of its use;

- re-instate area of temporary land-take to their former land use as soon as possible upon completion of the scheme; and

- during re-instatement of land, particular care should be taken to minimise disturbance to adjacent habitats to avoid further disturbance to the surrounding land.

Residual construction phase land-use impacts are assessed as neutral.

10.9. Traffic Noise and Vibration

There are no known noise sensitive receptors within the vicinity of the scheme, so no mitigation measures are required. A pre-construction otter survey will be undertaken to ensure that otter Holts or resting sites are not present in the vicinity of the scheme.

10.10. Pedestrians, Cyclists, Equestrians and Community Effects

Disruption to pedestrians and cyclists will be temporary with access restrictions and noise being the main impacts. It is considered extremely unlikely that there will be any impact to equestrians due to the remote nature of the scheme and resulting low use of the area by equestrians. In the unlikely event that equestrians do wish to pass then they should be able to use the temporary bridge. During the construction period it is conceivable that some pedestrian and cyclist's journeys, within the vicinity of the proposed scheme, will be longer, delayed, obstructed, noisier and subjected to a loss of amenity. The construction process will lower the amenity value of the area from a pedestrian's perspective and increase the noise from the site over a wider area. Pedestrians and others, if crossing the bridge on the A82, will be proximal to plant, construction activities and motor vehicles whilst passing through the Traffic Management, potentially resulting in increased levels of stress. If these impacts are not adequately managed, potential impacts may cause inconvenience to pedestrians and cyclists. The construction of the bridge and associated scheme will not directly impact on any of the footpaths near the site. However, parking and therefore access may be affected due to site compound location. There is no existing provision for walkers along the A82 road itself, so impacts will not increase during construction and will actually improve because there is

increased provision for foot passengers on the temporary bridge. Construction impacts are only expected to be slightly negative given the limited facilities for pedestrians and others at this locality.

Mitigation to reduce any negative effects will include:

- fencing of works with clear signage to avoid any negative health and safety issues;
- provision of designated temporary access routes (footways on the temporary bridge); and
- Sufficient room within the traffic management area to allow cars to pass cyclists safely.

The Mountaineering Council of Scotland expressed concern regarding the impact on visiting walkers and climbers during construction. Any delays will be notified through the Transport Scotland website.

The temporary nature of the impacts and implementation of the mitigation measures mean that the impacts to pedestrians and others during the construction period are considered to only be slightly negative as there will inevitably be some form of delay during construction due to traffic management.

10.11. Vehicle Travellers

Driver views will be affected by the presence of excavation and construction works, temporary accommodation works, earthworks, loss of vegetation, traffic management systems, an increase in signage prior to and within the works area, and the presence of onsite heavy machinery during the construction period. The construction process will unavoidably change traffic conditions and consequently the stress experienced by drivers. An increase in driver stress is likely to be brought about by construction plant accessing and exiting the main carriageway, possible alterations and extensions to journey routes and times, and queuing stationary traffic. The impact, whilst temporary, is likely to adversely affect vehicle drivers to some degree throughout the construction period.

Accommodation of the site compound and materials in the existing lay-bys will result in the loss of parking provision within Rannoch Moor. Furthermore, motorists will experience delays in both directions along this length of the A82. It is not possible to predict the length of delays at this time, but they are likely to be of a short duration. However, there may be periods when longer delays are experienced during peak travel periods. In addition, short closures of between three to ten minutes may be required in order to carry out some safety-critical works.

Mitigation of the impacts will include:

- not allowing storage areas to exceed the minimum area required;
- traffic management to maintain continuous traffic flow on the A82;
- installation of clear, advanced warning signs of the road works;
- Good maintenance of the construction site and storage areas.

Scotland TranServ will develop a strategy to anticipate and manage emergency vehicles needing access. The contractor will be required to advise police, fire and other emergency response agencies of construction activities, diversions and road closures throughout the construction process. Consideration will also be given to green-period biasing traffic lights based on the north-southbound traffic flow during peak periods, such as bank holidays and the summer season weekends, as well as one-off events attracting large numbers of people.

Even with the adoption of the mitigation measures, the temporary impacts will at worst cause a slightly negative impact to drivers' views from the road and stress, and the impacts are, therefore, insignificant.

10.12. Road Drainage and the Water Environment

Construction operations have the potential to have direct effects (

Table 10.1 and Table 10.2) on site drainage and hydrology with indirect contamination of the nearby watercourses and groundwater due to the:

- release of site surface water runoff; and
- Accidental spillage of chemicals, fuels, oils, concrete and other building materials into these watercourses.

Construction activities may result in the release of contaminated sediments, which if not adequately contained might become mobilised, draining into ground or surface waters. Surface-water runoff from the construction site may be high in suspended solids, fuel oils, lubricants and other chemicals used or stored on site. Construction site runoff, with high sediment load that reaches the local watercourses has the potential to adversely affect water quality and may disrupt or damage local aquatic ecosystems.

The stockpiling of soft materials, either excavated during construction or imported, can also be a key issue as they may liquefy during precipitation events, possibly entering ground or surface waters, thus increasing sediment loads.

There is potential for runoff derived from plant/vehicles utilised during the construction period to enter nearby ground or surface waters if not collected. Furthermore, there is a risk of accidental spillage or leakage of fuel/oil from storage tanks or construction plant. Without suitable mitigation measures, these pollutants (suspended solids, hydrocarbons from diesel, petroleum, oil and exhaust emissions, and vehicle-tyre wear deposits) have the potential to enter ground or surface waters.

Measures to reduce the potential effects of the construction activities on water quality will be necessary. The contractor will comply with SEPA Pollution Prevention Guidelines PPG1, PPG2, PPG4, PPG5, PPG6, PPG10, PPG13, PPG22, PPG23 and PPG26. This will be specified within the contract. The Contractor will be required to produce Method Statements for the construction activities to meet the SEPA requirements. The Method Statements will be approved by the Engineer. The Method Statements will detail the construction methodology to mitigate against pollution of surface and ground waters. The requirements will also be included in the Contractors Environmental Management System (EMS) or best practice procedures if the Contractor does not have an EMS, and all employees will strictly adhere to it. When working in close proximity to controlled surface waters, Contractors will be required to comply with the requirements of the Water Environment (Controlled Activities) (Scotland) regulations 2005 (also known as CAR) at all times.

Table 10.1 Generic impacts on the water environment due to construction activities.

Source of Impact	Potential Effects
Sewerage Accidental release of sewerage from the site compound.	Organic pollution to watercourses, potentially leading to increased biological oxygen demand and low dissolved oxygen, which can cause fish kills.
Oils, Fuels and Chemicals Spillage from storage tanks or leakage from mobile or stationary plant.	Oils form a film on the water surface resulting in an adverse effect on water quality and ecology. These oils can clog fish gills, cause loss of buoyancy to water birds as well as being toxic to aquatic organisms.
Sediment Loading/Suspended Solids Suspended solids and coarser sediment in the watercourse can result from excavations, runoff from stockpiles, plant and wheel washing, runoff from site roads, runoff during construction, earthworks and landscaping.	Sedimentation can cause damage to fish, aquatic invertebrates and plants through deposition resulting in a smothering effect or by interference with feeding and respiratory apparatus. Suspended solids may also bind to other contaminants, which can cause pollution of the receiving watercourse.
Concrete, Cement and Admixtures Accidental release into watercourses of the materials or from the washings of plant and machinery.	Concrete / cement are highly alkaline and must not be allowed to enter any drain or watercourse. Potential for adverse effects on aquatic organisms if pH elevated to/maintained above 8.5.

Table 10.2 Specific impacts to water environment due to construction activities.

Impact	Type of Water Resource Impacted	Description of Impact
Batching of Concrete (If site batching of concrete is required this means that large volumes of aggregate, sand and cement will be imported on the site with the concrete made *in situ*).	**Water Quality**	Concrete / cement are highly alkaline and must not be allowed to enter any drain or watercourse. Potential for adverse effects on aquatic organisms if pH elevated to / maintained above 8.5.
	Sediment Transport & Fluvial Geomorphology	There is the possibility of fine sediment (silt) getting into the watercourse which can cause discoloration of the water and have a detrimental effect on water quality.
Pouring of Concrete into False work and Curing	**Water Quality**	The pouring of concrete into false work (temporary structure used to support bridge) can lead to concrete release into the watercourse below. Accidental release of concrete can occur during curing (the process of setting and hardening of concrete).
	Sediment Transport &	No impact is predicted.

Impact	Type of Water Resource Impacted	Description of Impact
	Fluvial Geomorphology	
Bridge Demolition (Demolition of the bridge can introduce large quantities of coarse sediment into river channel.)	**Water Quality**	Sediments may cause damage to fish, aquatic invertebrates and plants through deposition and consequent smothering or by interference with feeding and respiratory apparatus.
	Sediment Transport & Fluvial Geomorphology	Coarse sediment delivery to the river channel may cause bed disturbance and some temporary water discolouration.
Construction of Temporary Bridge	**Water Quality**	Suspended solids entering channel may also contain contaminants, which can cause pollution of the receiving watercourse.
	Sediment Transport & Fluvial Geomorphology	Temporary bridge construction may disturb surrounding slopes and cause slope material to enter the River Ba. This may cause some localised deposition.
Construction of New Bridge	**Water Quality**	There is the possibility of sediment reaching the river channel during construction of the new bridge, with the same impacts as discussed above.
	Sediment Transport & Fluvial Geomorphology	Slope material may enter the watercourse.

More specifically, the Contractor will minimise potential pollution at source by adopting all of the following measures:

- scheduling construction activities so that the area and duration of soil exposure are minimised to that required for practical completion of the works;
- where possible, undertaking construction in phases so that sections are restored before progressing to the next section/phase;
- minimising the movement of construction plant and equipment on site;
- locating stockpiled material away from existing watercourses;
- containment of runoff prior to treatment and disposal;
- provision of wheel washes where appropriate to reduce transfer of sediment;
- adopting pollution prevention procedures at all times;
- no abstraction of water from or disposal of water into any watercourses; and

- Work at the edge of a watercourse will be minimised and, if necessary, a CAR licence will be sought otherwise CAR General Binding Rules to be followed.

- Silt traps to be used and maintained at all times throughout the duration of the works to prevent sediment entering the watercourse.

The construction site surface-water runoff will require removal and/or sediment/pollutant removal by the incorporation of appropriate containment and drainage mechanisms. These will be covered by PPGs 5 and 6 and within the required Method Statement.

Additional measures to be taken by the Contractor to minimise spillages from stored materials such as oils, fuels and chemicals include:

- storing these materials in bunded areas at the standard requirement of 110% containment capacity of the volume stored;

- spillage trays will be fitted to any stationary construction plant;

- any water resulting from washing out/cleaning plant and equipment will be contained and the sediments will be allowed to settle before being suitably disposed; and

- Any waste materials will be stored in designated areas and removed from the site in accordance with the Duty of Care principles. Again, these measures will be covered within relevant Method Statements.

- Excavated or imported soil will be stockpiled in a location away from watercourses. The stockpile area will be bunded to provide an impermeable barrier to the potential migration of pollutants into nearby water bodies. It may be necessary to cover stockpiles in times of particularly poor weather to minimise migration of particles.

- Any concrete will be mixed away from areas close to watercourses or locations where infiltration of water into the ground is possible. Ideally, the concrete will be mixed off site and delivered to the site. When conducting concrete works in or close to watercourses, an impermeable barrier will be necessary to prevent transport of cement particles to the watercourse. Mitigation measures for the specific impacts of the scheme are detailed in table 10.3

Table 10.3 Water environment mitigation measures for the construction phase for specific impacts.

Impact	Mitigation Measure
Batching of concrete	Measures must be taken to ensure that *in situ* concrete is placed accurately within a sealed off area and that concrete pumps including their wash-down do not discharge into the river. Measures must also be taken to prevent fine sediment entering watercourses through, for example, the use of temporary sheeting over exposed piles of sand and aggregate.
Pouring of concrete into false work and curing	To prevent concrete entering watercourse during the pouring of concrete into false work, a secondary layer of false work below the primary layer will be employed. This will act as a false bottom to intercept any concrete falling from above. This will remain in place until the concrete has set and hardened (curing process). The additional measure of a plastic sleeve around the area of works will be employed.
Bridge demolition	In order to minimise the impact of demolition on the river channel, all debris from the bridge must be removed from the site and care must be taken to ensure this material does not enter the river channel. Prior to any demolition work, an approved crash deck or similar structure must be provided in the adjacent area to protect the watercourse from falling debris and other waste arising. In order to prevent excessive dust and debris, the deck shall be removed by the formation of a number of fragments formed by stitch drilling/coring from above with dust removal by vacuum.
Construction of the temporary and new bridge	Slope disturbance will be kept to a minimum. Unconsolidated material that could be disturbed will be removed or stabilised by fine netting prior to vehicle access and construction. Sediment fencing must be placed at the bottom of the slope to trap any bank material that is washed out.

Finally, SEPA provide guidance and advice on pollution incident response planning in document PPG21. This guidance will be adhered to by the Contractor and included in the preparation of the Method Statement detailing the emergency procedures that will be undertaken should a pollution event occur. This will be specified within the EMS or best practice procedures written by the Contractor, and will be specified within the contract.

Assuming that the mitigation measures are implemented, the residual impact in terms of magnitude will be low and significance will be slight to negligible. Furthermore, with effective mitigation the risk of sediment release during construction will be reduced, therefore, the significance of the impact will be neutral. Notwithstanding the implementation of mitigation measures described above, some delivery of fine sediment to the river channel is likely to be unavoidable. Some temporary water discolouration during demolition and construction is also likely to occur, however, small volumes of fine sediment released are unlikely to have a significant impact on the fluvial geomorphology of the river channel. If the mitigation measures are implemented this should prevent large volumes of sediment being supplied to the river channel. As such, the residual impact for sediment transport and fluvial geomorphology is predicted to be neutral.

10.13. Geology and Soils

Geology will remain unaffected by the construction processes. Geomorphological processes and soils will be affected by construction activities in a number of ways. Peat and drift deposits will be excavated with some being permanently removed or used for landscaping works. In disturbed areas, exposed soil is liable to erosion by fluvial and Aeolian action. The movement of construction staff around the site may lead to local compaction of soil affecting its surface and subsurface hydrology, making it more liable to water logging, poaching, and erosion, because water will accumulate on the surface, and potentially lead to localised but intensive erosion where there is sufficient slope for the water to run off. There could potentially be some contamination of soils and minerogenic substrates from construction activities.

The potential loss of a small area of peat and minor disruption to two hummocky moraines means that the construction impact on geomorphology and soils can be assessed as slightly negative.

Disturbance to the geomorphological and soil attributes of the study area will be minimised through the adoption of the following mitigation measures:

- limitation of the extent and location of working and storage areas to non-sensitive areas;
- implementation of erosion and sediment controls;
- use of geotextiles to armour bare ground susceptible to erosion;
- minimise the risk of Aeolian erosion by regularly wetting bare areas of ground and erecting wind breaks;
- try to minimise steep, exposed and bare slopes that are susceptible to erosion;
- temporarily cut and remove peat (Chapter 8) and underlying glacial till where temporary features are to be erected;
- minimise compaction of soil by constructing suitable pathways for construction staff to travel along;
- appropriate handling and storage of wastes, chemicals and other materials;
- any exposed cuttings within the moraines will be graded so that the minerogenic material lies at an angle several degrees below the angle of repose for sandy substrate;
- reuse of excavated materials in the construction of embankments and landscaping where possible; and
- Reinstatement of substrate and soils on completion of the works. These materials will be stored in a suitably cool, well lit (though not direct sunlight) and moist environment.

Residual impacts are assessed as negligible because much of the soil and substrate will be reinstated, and that which is not reinstated will be used for the construction of the wider embankments.

10.14. Health and Safety

The Health and Safety Executive states that the Health and Safety at Work Act 1974 should not be compromised during construction. Best construction management practices will be in place to ensure the safety of construction workers during construction of the scheme. Fencing and lighting of construction works, recognised safety practices for the utilisation of heavy equipment and the movement of construction materials will be implemented to avoid accidents. During construction, the project contractor will be responsible for job-site safety and security. Diversions, lane closures and vehicle entrance locations will be well signed and managed appropriately to minimise disruption.

10.15. Storage of materials and waste, and site location

The following measures will be followed to ensure minimal disturbance and pollution from the site works as well as those already described throughout this report:

- Re-use and recovery of the material arising from the bridge demolition in preference to disposal;
- The site operators will adhere to all waste management licensing requirements; and
- If the compounds require lighting and provision of utilities, including water, foul drainage/septic tanks and electricity, the site operators will make the necessary arrangements with local landowners and comply with the relevant regulatory authority requirements for this purpose. It will be important to ensure that no areas are used that could significantly adversely impact on sites or features identified within this ES as requiring protection.

10.16. Summary of construction impacts

Impacts caused during the construction phase of the proposed scheme are typically short-term or temporary in nature. When coupled with the implementation of mitigation measures specified in the contract and the development of a construction environmental management plan (CEMP) by the Contractor prior to commencement of works on site, many of these impacts are predicted to be avoided or reduced. As such, residual construction phase impacts are assessed as being slight to moderately negative, at worst.

To further reduce any potentially significant adverse impacts, management of the construction phase by the Contractor will be undertaken in accordance with the requirements of the Scottish Government, Scottish Natural Heritage and the Scottish Environment Protection Agency.

11. POLICIES AND PLANS

11.1. Introduction

This section reviews the national, regional and local transport, planning and environmental policies relevant to the replacement of Ba Bridge on the A82 Trunk Road in Rannoch Moor and assesses how the achievement of the policy objectives would be hindered or facilitated by the scheme.

11.2. Methods

This section has been prepared in general accordance with the principles and techniques outlined in 'The Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 12 – Impact of Road Schemes on Policies and Plans'. The aims of this section are to: (1) establish a schedule of national, regional and local policies and objectives (Table 11.1); (2) assess the likely impact of the scheme on the policy objectives listed in the schedule; and (3) note the views of the relevant planning authorities on the impact of the preferred route on planning policy objectives.

11.3. National policies and objectives

Table 11.1 Relevant government planning and policy documents.

Policy No.	Title	Publication Date
National Planning Policy Guidelines		
SPP1	The Planning System	2002
SPP7	Planning and Flooding	2004
SPP15	Planning for Rural Development	2005
SPP17	Planning for Transport	2005
NPPG5	Archaeology and Planning	1994
NPPG14	Natural heritage	1999
NPPG18	Planning and the Historic Environment	1999
Planning Advice Notes		
PAN60	Planning and Natural Heritage	2000
PAN65	Planning and Open Space	2003
PAN75	Planning for Transport	2005

11.3.1. National Planning Framework for Scotland

The National Planning Framework (NPF) for Scotland (2004) is a non-statutory planning policy document. The NPF looks at Scotland from a spatial perspective and sets out an achievable long-term vision. It provides a view of Scotland as a place and identifies likely change to 2025 to ensure different areas can develop to their full potential. The NPF identifies key strategic infrastructure needs in order to plan for the right investment in the right places. The NPF provides a national context for development plans and planning decisions and will inform ongoing programmes of the Scottish Government, public agencies and local government.

11.3.2. Scottish Planning Policy 1

Scottish Planning Policy 1 (SPP1: The Planning System, 2002) provides an overview of the land use planning system in Scotland under current arrangements. It sets out the key principles and the Scottish Government's priorities for the system to guide policy formation and decision making towards the goal of sustainable development. SPP1 identifies seven strategies to promote a more sustainable, effective and integrated transport system in Scotland. The most relevant strategies to this scheme are: (1) promoting an efficient transport network for the movement of freight and goods distribution; and (2) providing direct and safe access to local facilities. Therefore, the scheme broadly adheres to the key national policy aims of promoting integrated and sustainable transport infrastructure.

11.3.3. NPPG5 Archaeology and Planning, and NPPG18 Planning and the Historic Environment

NPPG5 and NPPG18 set out the requirements for developments likely to affect the historic environment. These have been considered within the assessment of impacts on cultural heritage within the Disruption Due to Construction chapter (Chapter 10), with no impacts on such features envisaged.

11.3.4. SPP7 Planning and Flooding (2004)

SPP7 replaces NPPG7 Planning and Flooding, providing guidance relating to development and flooding. The proposed scheme is not expected to adversely affect local floodplains in the vicinity of Ba Bridge.

11.3.5. NPPG10 Planning and Waste Management

NPPG10 provides policies concerning the recovery or disposal of waste without harming human health or the environment. Some of the waste produced from excavations for the replacement bridge and demolition of the existing bridge will be reused in construction of the walls, supporting walls and embankments, however some will require to be disposed of. No impacts on human health are envisaged and impacts on the environment will be minimised through disposal at a waste management facility in accordance with the waste management regulations and Duty of Care requirements.

11.3.6. NPPG14 Natural Heritage and PAN 60 Planning and Natural Heritage

NPPG14 sets out policy on the assessment of development proposals showing due concern for natural heritage. It deals, in detail, with requirements for development likely to affect sites of national and international importance. Chapter 6 (Geology and Soils), Chapter 7 (Road Drainage and the Water Environment) and Chapter 8 (Ecology and Nature Conservation) have considered the objectives of NPPG14 and, where appropriate, incorporated these into proposed mitigation measures to address any predicted adverse impacts on nature conservation.

11.3.7. SPP15 Planning for Rural Development

SPP15 replaces National Planning Policy Guideline (NPPG) 15: Rural Development issued in 1999. This SPP sets out the approach, key messages and objectives that should underpin planning policies and decisions affecting rural areas. It also describes the increasingly important links between development planning and community planning. There is no other development occurring at this site, it is a simple on-line bridge replacement.

11.3.8. SPP17 and PAN 75 Planning for Transport

Scottish Planning Policy 17 (SPP17: Planning for Transport, 2005) provides the framework for the development of an integrated transport system in Scotland. Scheme proposals are viewed within the context of government guidance on development in the countryside, development affecting agricultural land and development affecting nationally designated sites such as SSSIs, Listed Buildings and Scheduled Ancient Monuments.

The proposals meet the requirement to rigorously assess such schemes in relation to economy, safety, environment and accessibility. In addition, the scheme meets the objective of minimising the impact of roads and traffic on the global and local environment through, firstly, the incorporation of sustainable design solutions where possible, and secondly, the implementation of appropriate mitigation. The main objectives of SPP 17 are as follows:

- A transport network to support the economy, assist in reducing the need to travel, create the right conditions to promote sustainable transport modes and restrict adverse environmental impacts.

- The interaction of accessibility, transport and the development strategy to be considered early in the planning process with land allocations taking into account transport opportunities alongside economic competitiveness and sustainable development.

- Strategic land-use plans to co-ordinate with Regional and Local Transport Strategies, and settlement strategies and identify where economic growth or regeneration requires additional transport infrastructure.

- Local plans to relate new land use allocations to transport opportunities and constraints and locate new development to maximise sustainable transport modes.

- Development likely to affect trunk and other strategic roads to be managed so as not to adversely impact on safe and efficient strategic traffic flows. New trunk road or

motorway junctions will only be considered exceptionally and will require significant developer funding.

- Roadside facilities to be considered under a special case for development affecting strategic routes. The comfort and safety of drivers should be accommodated through opportunities to stop and rest.

The relevant objectives of SPP 17, PAN 58 and PAN 60 have been integrated into the design of the proposed road improvement wherever possible.

11.4. Local policies and objectives

The existing adopted development plans that cover the Rannoch Moor area comprise the Highland Structure Plan 2001 and the Lochaber Local Plan 1999.

Policies and proposals within each plan, relevant to the proposed scheme, include those relating to infrastructure, sustainability/environmental improvements, access/footpaths and cycling, nature conservation, landscape, tourism and archaeology. These policies are set out in Appendix G.

11.4.1. Lochaber Local Plan, 1999

The Highland Council Planning and Development Service have highlighted the following policies in particular as of significance to the proposals:

- Lochaber Local Plan, 1999, Policy 3.5.1 – The Council will encourage the Scottish Office to give priority to the allocation of resources necessary to undertake longstanding improvement and realignment of the A82(T) and A830(T).

- Lochaber Local Plan, 1999, Policy 3.5.2 – The site is located within an area where the strategic road network should be upgraded where there are traffic hazards, and such improvements shall be carried out in a manner sympathetic to the rural character of the area.

- Lochaber Local Plan 1999, Policy, 3.6.1 – The Council will not permit development or damaging operations to an interest to be protected within designated or proposed Special Protection Areas and Special Areas of Conservation except where there is an imperative and overriding public, social, economic, health or safety interest.

- Lochaber Local Plan, 1999, Policy 3.6.2 – The site lies within an SAC, where there is a presumption against development which would have a significant detrimental effect upon these designations

- Lochaber Local Plan 1999 Policy 3.6.3 – The site lies within a SSSI and National Scenic Area, where there is a presumption against development which would have a significant detrimental effect upon these designations.

- Lochaber Local Plan, 1999, Policy 3.6.5 – The Council will seek to maintain continuity and linkage between habitats where this would help to sustain wildlife.

Subject to SNH advice to their specific value, particular features which should be taken into account are, for example, rivers.

- Lochaber Local Plan, 1999, Policy 3.6.12 – The site lies within a National Scenic Area, thereby safeguarding the scenic and landscape character.

- Lochaber Local Plan, 1999, Policy 3.6.14 - The Council will encourage increased public access (to rights of way, hill routes and paths) and the enjoyment of the countryside, subject to agreement of landowners where necessary and the need for compatibility with natural heritage interests.

- Lochaber Local Plan, 1999, Policy 3.6.19 - To protect against development which would adversely affect the character or setting of areas of archaeological significance and in areas of high archaeological potential, may require developments to establish the nature, extent and importance of any remains.

- Lochaber Local Plan, 1999, Policy 3.6.23 – The Council will continue to give high priority to environmental improvements. The design of scheme, use of materials and treatments will be compatible with their surroundings.

- Lochaber Local Plan, 1999, Policy 6.2.22 – The Council will encourage enhanced public access into Glen Coe from the village and other places of visitor activity. Any physical works or engineering operations should achieve the highest standards in respect of design and safeguards for the environment.

- The Highland Council Planning Department has confirmed that there are no planning applications of relevance to the proposed scheme.

11.4.2. Sustainability/environmental improvements

These policies are of relevance to the scheme by requiring that developments are assessed in relation to a range of environmental issues including local communities, pollution, designated areas, cultural heritage, air quality and landscape issues. These issues have been addressed through the EIA process and mitigation measures proposed to reduce the environmental impacts associated with options and to enhance the environment wherever possible. This process supports these policies and, therefore, no significant conflicts with the policies are envisaged.

11.4.3. Access/footpaths and cycleways

Policies relate to the development of cycle ways and the development and safeguarding of Rights of Way and strategic footpaths within the Highlands. The proposed scheme does not specifically allow for cycle ways as it comprises a replacement structure for the existing Ba Bridge, which does not provide for this facility due to site constraints. No long-term adverse impacts are predicted on existing footpaths. A footway will be provided on the replacement structure, providing pedestrians with safer passage across the bridge. The provision of a footway will be an improvement on the existing situation as none are provided beside the existing Ba Bridge. The proposed scheme, therefore, supports the objectives of these policies.

11.4.4. Nature conservation

Policies concern the protection of sites of international, national and local importance to nature conservation, including SSSIs and SPAs. The scheme is situated within the Rannoch Moor SSSI and SAC and is on the boundary of the Loch Ba SPA. With appropriate mitigation the nature conservation interest will remain undisturbed.

11.4.5. Landscape/tourism

Policies relate to enhancing present landscape character and safeguarding the scenic and landscape character within designated National Scenic Areas, as well as the protection of scenic views from tourist routes and viewpoints. These policies also encourage high standards of design and the development of measures to minimise visual impact. There will be some visual impact from the replacement of the bridge, but this will reduce through time as the materials of the bridge weather and the surrounding disturbed land regenerates. During the first few years of operation of the scheme this may cause slight conflict with the policy.

11.4.6. Archaeology

Policies seek to protect against development that would adversely affect areas of archaeological interest or potential. As archaeological features are not predicted to be affected, there will be no impact on these policies.

11.4.7. Waste management

Policies concerning waste management require a method statement to be prepared for major developments to minimise and manage the waste generated. A Method Statement will be prepared by the Contractor addressing the issues raised in this ES. Non-compliance with these policies is considered to cause a slight to moderate impact. However, appropriate mitigation will minimise these impacts.

11.5. Mitigation

The design of the proposed scheme has sought to accord with relevant planning policies and to avoid significant adverse effects on the environment. Where impacts cannot be avoided, appropriate mitigation measures will be implemented. Measures are highlighted in the appropriate sections of this assessment. However, the key measures are identified as follows:

Implementation of relevant SEPA PPGs and other mitigation measures suggested throughout this ES during construction of the proposed scheme; and

Implement landscape, ecological and hydrological mitigation as described throughout this report.

11.6. Summary

The scheme will help to promote an efficient and safe transport network for the movement of freight and goods distribution, meaning that the scheme broadly adheres to the key national policy aims of promoting a sustainable transport infrastructure.

In order to facilitate and adhere to predominantly environmental, but also some other local level and strategic policies, mitigation measures are required to address the potential impacts of the scheme.

Environmental aspects have been taken into consideration during the design process. The development of the scheme has identified and taken into consideration those areas (and receptors) identified as sensitive in terms of ecology, hydrology, land use, and landscape and visual impacts. Where avoidance of impacts has not been possible through design specification alone, specific mitigation measures will be implemented.

No cumulative impacts in relation to policies and plans have been identified.

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13. ENVIRONMENTAL IMPACTS TABLE

This chapter presents the Environmental Impacts Table (Table 13.1) for the proposed scheme. The purpose of the Table is to present the main predicted impacts (taking account of agreed mitigation) in summarised form.

The table includes the following:

- Description of the potential impact;
- Mitigation objective and commitment;
- Sensitivity/value of the receptor;
- Duration of the impact;
- Magnitude of the impact with mitigation in place; and
- Significance of the impact with mitigation in place.

DMRB guidelines state that the 'do nothing' or 'do minimum' options should be included in the Environmental Impacts Table. However, in this particular circumstance, do nothing or do minimum would mean putting a weight restriction on the bridge which is not considered feasible as it is a main Trunk Route. Therefore, the 'do nothing' and 'do minimum' options have been omitted from this table.

The Environmental Impacts Table includes mitigation item numbers that can be cross referenced to specific mitigation measures in Table 14.1.

Table 13.1 Environmental Impacts Table

Potential Environmental Impact	Mitigation Item Number (refer to Table 13.1)	Sensitivity/ value of Receptor	Residual Impacts		
			Duration of Impact (short/long term)	Magnitude of Impact (after Mitigation)	Significance of Impact (after Mitigation)
Geology and soils					
Slight re-grading of embankment and drift-deposit slopes resulting in a slight loss of minerogenic material from the drift-deposit slopes and the covering and possible compaction of peat beneath the widened embankment slopes.	3, 4, 17	low	long term	minor	slight
Excavation of drift deposits will result in a small loss of minerogenic material and supporting soil, with associated localised changes to hydrology	1, 10, 15, 16, 52	low	short term	minor	negligible
Excavation of peat will result in a small loss of organic material, and a slight localised change to peat structure and hydrology.	1, 2, 5, 8, 9, 10, 12, 13, 14, 15, 16, 18, 52, 53	high	short and long term	minor	slight
The cutting of two moraines will result in a small loss of minerogenic material.	11, 12, 14	low	long term	minor	negligible
Disturbance of peat, through compaction and loss of structure caused by the movement of plant and construction staff around the site	67, 68, 71	high	long term	negligible	negligible

Potential Environmental Impact	Mitigation Item Number (refer to Table 13.1)	Sensitivity/ value of Receptor	Residual Impacts		
			Duration of Impact (short/long term)	Magnitude of Impact (after Mitigation)	Significance of Impact (after Mitigation)
Road Drainage and the Water Environment					
Sediment release from construction activities and bare areas of soil affecting water quality	13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 30, 33, 34, 68, 69, 70, 75, 77	high	short term	negligible	negligible
Coarse sediment delivery not removed by low competency river flow	13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 30, 33, 34, 68, 69, 70	high	long term	negligible	negligible
Sediment loading smothering habitats and affecting the breathing apparatus of fish and aquatic invertebrates	13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 30, 33, 34, 68, 69, 70, 75, 77	high	short term	negligible	negligible
Discolouration from silt and clay sedimentation	13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 30, 33, 34, 68, 69, 70	high	short term	negligible	negligible
Reduction of fish spawning ground from sediment filling voids	13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 30, 33, 34, 68, 69, 70	medium	long term	negligible	negligible
Introduction of coarse, angular, foreign sediment from the demolition of the bridge	19, 20, 21, 22, 25, 30, 34, 36, 37, 68, 70	high	long term	negligible	negligible
Delivery, storage and removal of large quantities of stone and aggregate may result in the transfer of some of the material to the river channel	15, 19, 20, 21, 22, 24, 26, 68, 69, 75	high	short term	negligible	negligible

Potential Environmental Impact	Mitigation Item Number (refer to Table 13.1)	Sensitivity/ value of Receptor	Residual Impacts		
			Duration of Impact (short/long term)	Magnitude of Impact (after Mitigation)	Significance of Impact (after Mitigation)
Vehicle movement will transfer fine sediments around the site that could be washed into the channel	12, 19, 23, 24, 30, 33, 35, 75	high	short term	negligible	negligible
Ecology and Nature Conservation					
~ 5 m^2 of habitat loss	1, 2, 5, 6, 7, 8, 9, 10, 12, 13, 14, 38,, 41, 43, 52, 53, 71, 75	medium	long term	minor	slight
Temporary impacts to wetland habitats from construction activities, including pollution, siltation, spray and runoff	19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 67, 68, 69, 70, 75	high	short term	negligible	negligible
Fluvial and Aeolian deposition of construction materials onto semi-natural habitats	8, 10, 11, 12, 13, 15, 23, 45, 46, 49, 69, 75	medium	short term	negligible	negligible
Possible loss of trees	38, 39, 75, 78	medium	long term	moderate	slight
Disturbance to mammals (if present) by construction	39, 41, 42, 75, 76, 78	high (if present)	short term	minor	slight
Possible disturbance to aquatic wildlife	See water environment section above	very high	long term	minor	slight
Landscape and Visual					
Disturbance to the tranquil character of the area by the presence and activities of major construction plant and workforce	42, 54, 55, 56, 57	high	short term	moderate	slight
Detraction from the natural landmarks and scenic beauty of the area	27, 43, 61, 64, 65, 73	high	short term	moderate	slight

Potential Environmental Impact	Mitigation Item Number (refer to Table 13.1)	Sensitivity/ value of Receptor	Residual Impacts		
			Duration of Impact (short/long term)	Magnitude of Impact (after Mitigation)	Significance of Impact (after Mitigation)
Loss of roadside mire, heath, peat and drift deposits	As for geology, geomorphology and Soils section	medium	long term	minor	slight
Potential pollution of River and Loch Ba	As for Ecology and Nature Conservation section	high	short term	negligible	negligible
Very minor loss of moorland vegetation, minor loss of willow carr and individual birch and rowan adjacent to the bridge	As for Ecology and Nature Conservation section	medium	long term	minor	slight
Changes to the character of the area due to the use of new, non-local materials, particularly the concrete, tubular rail parapet and steel girders to support the new, wider bridge deck	74	high	long term	minor	slight
Disruption Due To Construction					
Temporary requirement of some peatland/moorland for the temporary bridge and works	See Geology, Geomorphology and Soils section	high	short term	minor	slight
Some pedestrians and cyclist's journeys within the vicinity of the proposed scheme will be longer, delayed, obstructed, noisier and subjected to a loss of amenity	58, 59, 60, 62, 63	low	short term	minor	slight

Potential Environmental Impact	Mitigation Item Number (refer to Table 13.1)	Sensitivity/ value of Receptor	Residual Impacts		
			Duration of Impact (short/long term)	Magnitude of Impact (after Mitigation)	Significance of Impact (after Mitigation)
Pedestrians and others, if using the A82, will be proximal to plant, construction activities and motor vehicles whilst passing through the traffic management	67	low	short term	minor	slight
Parking and thus access to paths will be affected due to the location of the site compound	61	low	short term	minor	slight
Temporary alteration to drivers views	61, 62	high	short term	minor	slight
Increase in driver stress from construction activities and delays	58, 60, 61, 62, 63, 64, 66, 67	low	short term	minor	slight
Impacts on the water environment similar to those discussed above	As for Ecology and Nature Conservation section	high	short term	negligible	negligible
Planning Policies					
No predicted impacts					

14. SCHEDULE OF ENVIRONMENTAL COMMITMENTS

All mitigation measures identified in this Environmental Statement are necessary to protect the environment prior to and during construction, or during operation of the proposed road and bridge. These measures will be incorporated into the Contract Documents. This will provide a mechanism to ensure compliance with environmental commitments.

The purpose of the Schedule of Environmental Commitments is to collate mitigation measures identified throughout the ES, both for ease of reference and for use by those overseeing the Contract Documents. It is intended to provide a record of commitments that will be incorporated within the Contract Documents and to which the contractor will be obliged to adhere throughout the Contract period, although it is recognised that there may be a need to revise or supplement the commitments by agreement between the Contractor, the Scottish Government, the planning authority and other interested parties as construction proceeds.

Table 14.1 provides a summary of the mitigation measures, which are detailed more fully in the relevant sections of this ES. Reference should be made to individual sections of the ES for further explanation. Specifically, the following has been tabulated in Table 14.1:

- the mitigation measure;
- the effect of the mitigation on the impact;
- the timing of the mitigation measure;
- any monitoring requirements; and
- Any additional consultation required.

Should the contractor propose significant changes or modifications to the proposed scheme assessed for this EIA, this would mean that the impacts could be different and therefore appropriate mitigation measures to address these impacts will be required to be implemented. If this is the case, the contractor will be required to publish an addendum to the ES, within which appropriate impacts and mitigation measures will be laid out. This addendum will include a revised Schedule of Environmental Commitments to reflect any changes. The revised commitments will then be included in the contract documents. The final design will not give rise to impacts which are any worse than those described in this ES unless a subsequent addendum is issued for consultation.

The Schedule of Environmental Commitments (Table 14.1) addresses the predicted impacts previously summarised in the Environmental Impact Tables (Table 13.1). The mitigation item numbers provided in the first column of Table 14.1 enable cross-referencing between these two Tables.

Table 14.1 Schedule of environmental commitments. All mitigation required during the construction, operation and maintenance of the scheme.

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
1	Strip turves and substrate by hand or small excavator in areas to be affected so that they can be re-used during re-establishment of the area after construction.	Prevents irreparable damage to moorland vegetation and peat.	Pre construction	
2	Re-establishment of peat and their overlying turves.	Maintains the site's ecological integrity.	Post construction	Post construction site visits to monitor re-establishment of site area.
3	Re-use of stored peat turves on new embankment slopes.	Prevents loss of vegetation and introduction of non-local vegetation.	Post construction	As above
4	Left over excavated glacial drift deposits can be used to re-grade the wider embankment slopes.	Recycling of local material, minimising use of material from other sources.	Post construction	
5	Protect the stored turves and substrate from excess precipitation, high winds and direct sunlight, and they should be stored for as short a period as possible.	Maintains their condition, so they can be re-instated.	During construction	Monitoring of turves during storage to ensure that they are kept in good condition.
6	Storage of bulk material not permitted directly on peatland.	Prevents damage (compaction) to sensitive peat.	During construction	
7	Additional soil or substrate procurement will be from local sources.	To maintain the visual integrity of the site.	During construction	
8	Watering exposed soil surfaces (during dry conditions).	Prevents erosion by Aeolian processes.	During construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
9	Schedule construction activities so that the area and duration of soil exposure are minimised.	To reduce potential for erosion and sedimentation of water courses.	Pre construction	
10	Where disturbance to soils sensitive to erosion is probable during construction of the temporary bridge, they must be removed or protected by geotextiles or other protective materials.	Prevents unnecessary damage to vegetation and peat.	Pre construction	
11	If there are to be exposed cuttings within the moraines they will be graded so that the minerogenic material lies at an angle several degrees below the angle of repose for sand substrate.	This will prevent slippage of material and its consequent mobilisation/transportation.	During construction	
12	Access to slopes following reinstatement of material must be prevented to minimise the erosion risk.	To minimise the erosion risk.	Post construction	
13	Fine, biodegradable geotextile netting will be used to maintain soil stability whilst vegetation re-colonises or re-establishes itself.	Prevents loss of soil and the seed bank from erosion and stabilises exposed soil and young growth.	Post construction	
14	Monitor the areas of peat to be re-established for a minimum of at least 3 years.	To ensure successful re-establishment.	During operational phase	Annual monitoring of turves condition and regeneration of vegetation
15	Try to minimise steep, exposed and bare slopes that are susceptible to erosion.	To prevent a supply of sediment that could smother vegetation or enter the watercourse.	Pre and during construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
16	Minimise compaction of soil by constructing suitable pathways for construction staff to travel along.	Prevents damage and compaction to the peat.	Pre and during construction	
17	Re-use excess excavated materials in the construction of embankments and landscaping where possible.	Prevents foreign material having to be used and the excavation of locally-sourced material.	During construction	
18	All other cuttings will be covered by the peat and turves which have been stored on completion of the works.	Restores the landscape to as near its pre-construction character as possible.	Post construction	
19	Minimise or eliminate the delivery of sediment to the river channel.	To prevent/reduce sedimentation of the watercourses.	During construction	
20	Sand bag the banks of the river or enclose the banks with sediment fences to prevent slope wash from entering into the river channel, or at least intercepting the larger sediment particles.	As above	Pre and during construction	Monitor the condition and state of the sand bags and sediment fences to ensure that sediment doesn't pass through.
21	Install silt traps along channel margins using suitable geotextile matting.	As above	Pre and during construction	Monitor and clean traps after periods of rainfall or activity.
22	All debris from the demolition of the bridge must be removed from the site to ensure material does not enter the river channel and disposed of at an official landfill site or recycled on site. Deck will be removed by the formation of a number of fragments formed by stitch drilling/coring from above with dust removal by vacuum.	Reduces sedimentation of the water courses and smothering of surrounding vegetation.	During construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
23	Wheel-wash facilities must be used to minimise accumulation of mud on road surfaces and to minimise the transfer of sediment, and the effluent generated must be removed from site.	Prevents the spread of material around the site and the resultant sedimentation of watercourses.	During construction	
24	Prevent or contain drainage and surface runoff from the site during site clearance, construction and post construction to ensure no water pollution or sedimentation. These will be covered by PPGs 5 and 6, and within the required Method Statement.	Prevents water pollution and sedimentation.	Pre and during construction	Monitor and check for any leakage from the containment methods.
25	Provision of a crash deck or similar structure to protect the River Ba from construction materials and debris.	Prevents foreign materials from entering the watercourse.	During construction	
26	Aggregate must not be stored close to the river channel, the surrounding slopes or sensitive areas in order to minimise risk of material being washed into the channel during rainfall.	Minimises the risk of material being washed into the channel during rainfall.	Pre and during construction	
27	Drainage will be via a catch-pit and swale which shall be designed, installed and maintained in line with the SUDS manual.	Will improve water quality	Pre, during and post construction	
28	Adopt pollution prevention procedures at all times.	To prevent pollution.	During construction	
29	No abstraction of water from or disposal of water into any watercourses.	Prevents alteration to the hydrological regime and pollution.	Pre and during construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
30	Work at the edge of watercourses will be minimised, but where required, the banks of the watercourse will be protected. If necessary a CAR licence will be sought, otherwise CAR General Binding Rules to be followed.	To prevent erosion of river banks and sedimentation of watercourse.	During construction	Ensure the measures taken to protect the river banks are effective.
31	Oils, fuels and chemicals will be stored in bunded areas at the standard requirement of 110% of containment capacity of the volume stored.	To prevent pollution from leaks and spills.	Pre and during construction	Monitor regularly for leaks.
32	Spillage trays will be fitted to any stationary construction plant.	As above.	During construction	Regularly check that spillage trays are in good condition.
33	Any water resulting from washing out/cleaning plant and equipment will be contained and the sediments allowed to settle before being suitably disposed of.	To prevent pollutants from affecting vegetation and watercourses.	During construction	Monitor for leaks in the containment devices.
34	In-river working will be restricted to the immediate vicinity of the existing bridge with no access permitted upstream of this in order to safeguard the population of the protected freshwater invertebrate species.	Prevents disturbance to aquatic fauna and disturbance to sediments.	Pre and during construction	
35	The Contractor will comply with the following SEPA Pollution Prevention Guidelines: PPG1, PPG2, PPG4, PPG5, PPG6, PPG10, PPG13, PPG22 PPG23 and PPG26.	To reduce and/or eliminate the pollution potential.	During construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
36	The Contractor will be required to produce Method Statements for the construction activities to meet the SEPA requirements.	As above.	Pre construction	
37	When working in close proximity to controlled surface waters, contractors will be required to comply with the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2005 at all times.	As above.	During construction	
38	Habitat clearance required for the scheme and the peatland and turf translocation procedures will be adhered to.	To avoid unnecessary damage to habitats and to ensure the integrity of the moorland.	Pre and during construction	
39	Habitat clearance and tree removal will be undertaken 'outside of the bird breeding season' and done under the guidance of the Contractor's Experienced Ecologist. If site clearance can't be undertaken outwith the bird breeding season, then all vegetation will first have to be checked for breeding birds before removal. If evidence of breeding birds is found then ground clearance must cease until nests have been vacated.	To avoid disturbance to breeding birds.	Pre and during construction	Monitoring by the Contractors Experienced Ecologist.
41	Fencing off vegetation (and associated terrestrial invertebrates) in areas where no works are occurring at Ba Bridge with a geotextile membrane to protect both vegetation and invertebrates.	To prevent the deterioration of adjacent habitat due to potential construction pollutants.	During construction	Daily monitoring of protective fencing to ensure the integrity of the fencing and whether any animals have become trapped.

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
42	Night time working will be kept to a minimum in order to prevent disturbance to sensitive nocturnal species such as otter and bat. Any artificial lighting will be very localised, temporary and direct illumination of the River Ba will not occur. Otter fencing will be put in place along the river banks to encourage otters to continue to use the river corridor as a commuting route.	To avoid disturbance to local fauna.	During construction	
43	Compliance with SNH's consultation response, which requires a method statement, set of principles and landscape restoration plan to ensure that the desired end result for the replacement bridge, topsoil reinstatement and re-establishment of vegetation is achieved.	To ensure that there is little disturbance to the landscape.	Pre construction	
44	The contractor will be required to employ proactive working methods to minimise dust creation by ensuring all workers are aware of the possibility for dust nuisance, the conditions likely to result in dust nuisance and the measures required to avoid or minimise dust nuisance.	To prevent dust generation that may affect local vegetation and air quality.	Pre construction	
45	Requirements to avoid, minimise and control the generation of airborne dust will be developed by the contractor as a Method Statement.	As above.	Pre construction	
46	Minimise drop heights during the handling of bulk materials.	As above.	During construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
47	Undertake regular vehicle maintenance to ensure that emissions of soot and other pollutants in vehicle exhausts are minimised.	To prevent air pollution.	Pre and during construction	
48	Switch off machinery and vehicles which are not in use.	As above.	During construction	
49	Cover dust-producing materials in trucks leaving and entering the construction site.	To prevent dust generation that may affect local vegetation and air quality.	During construction	
50	Conform to all relevant local authority requirements or restrictions for dust generation during construction.	As above.	During construction	
51	Should unanticipated archaeological artefacts/remains be encountered during construction, they should be dealt with in accordance with procedures set out in 'Special Requirements in Relation to Historic Scotland' and agreed with Historic Scotland, Scottish Natural Heritage and the Scottish Executive. A trained archaeologist will be called in if artefacts are believed to have been uncovered.	To protect and preserve any unanticipated archaeological artefacts.	During construction	
52	Minimise the area of temporary land-take and the duration of its use.	To avoid wide-spread disturbance to moorland habitats.	During construction	
53	During re-instatement of land, particular care will be taken to minimise disturbance to adjacent habitats.	To prevent further wide-scale damage.	Post construction	Monitor the condition of vegetation adjacent to re-instated areas

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
54	Low-noise-emission machinery will be used where feasible.	Minimise noise disturbance.	During construction	
55	Machines that are used intermittently will be shut down between periods of activity.	As above	During construction	
56	All machinery will be well maintained (abnormal increases of noise are often associated with wear and tear, indicative of mechanical failure).	As above.	During construction	Continually monitor the performance of machinery.
57	All construction work will be undertaken in accordance with codes of practice for construction work and piling as outlined in BS 5228.	As above.	During construction	
58	Fence off works with clear signage to avoid any adverse health and safety issues for pedestrians.	Increase pedestrian safety near and passing through the site.	During construction	
59	Provision of designated temporary access routes (footways on the temporary bridge).	As above.	During construction	
60	Provide sufficient room within the TM area to allow cars to pass cyclists.	Reduce the danger and stress experienced by cyclists.	During construction	
61	The size and extent of working and storage areas should be minimised.	To avoid stress and delays to travellers.	Pre and during construction	
62	Appropriate traffic management to maintain continuous traffic flow.	Reducing delays and driver frustration.	During construction	
63	Install clear, advanced warning signs of the road works.	Reducing driver stress.	During construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
64	Good maintenance of the construction site and storage areas.	As above.	During construction	
65	Use of temporary floodlighting to be utilised only when strictly necessary.	To avoid disturbance to fauna and not dazzle motorists.	During construction	
66	Development and implementation of a strategy to anticipate and manage emergency vehicles needing access.	To facilitate emergency responses.	Pre construction	
67	Minimise the movement of construction plant and equipment on site.	Prevents delays and driver frustration.	During construction	
68	Any waste materials will be stored in designated areas and removed from the site in accordance with the Duty of Care principals and appropriate waste management licences obtained.	To reduce pollution and visual impact.	During construction	
69	Excavated or imported soil will be stockpiled in a location away from watercourses and covered or wetted to minimise wind erosion. The stockpile area will be bunded to provide an impermeable barrier to the potential migration of pollutants into nearby water bodies. It may be necessary to cover stockpiles in times of particularly poor weather to prevent pollution of watercourses.	To prevent pollution and sedimentation.	During construction	Monitoring of bunding to ensure no leaks.

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
70	Any concrete will be mixed away from areas close to watercourses or locations where infiltration of water into the ground is possible. Ideally, the concrete will be mixed off site and delivered to site. When conducting concrete works in or close to watercourses, an impermeable barrier may be necessary to prevent transport of cement particles to the watercourse.	Prevent contamination of watercourses.	During construction	
71	Limit the extent and location of working and storage areas to non-sensitive areas.	Prevents unnecessary damage to vulnerable terrain.	Pre construction	
72	The Health and Safety at Work Act 1974 should not be compromised during construction.	Minimises the risk of injury to employees.	During construction	
73	If the compounds require lighting and provision of utilities, including water, foul drainage/septic tanks and electricity, they will make the necessary arrangements with local landowners and comply with the relevant regulatory authority requirements for this purpose. It will be important to ensure that no areas are used that could significantly adversely impact on sites or features identified within the ES as requiring protection.	Reduce disturbance to the local environment and infrastructure.	Pre and during construction	
74	Use of local materials, materials that weather rapidly and sensitive design.	Minimises the impact of the structure on the character of the area.	during and post construction	

Item no.	Mitigation Measure	Effect of Mitigation on Impact	Timing of Mitigation Measure	Monitoring Requirements
75.	The Contractor's Experienced Ecologist will be appointed to oversee all operations that could impact upon the environment and will be on site during sensitive operations.	Will ensure mitigation measures are implemented correctly in order to protect the environment and will be a source of advice throughout the work	Pre, during and post construction	
76.	An otter ledge will be incorporated into the design of the new bridge	Will ensure improved access for otters along the River Ba	During construction	
77.	The population of protected freshwater invertebrate species will be monitored during and for at least 3 years post construction.	This will provide evidence of any damage to the population caused by construction activities and also will monitor any short-term recovery of the population due to improved drainage.	During and post construction.	Ongoing throughout the works and thereafter on an annual basis for at least 3 years.
78.	Bat, otter and water vole surveys are to be conducted prior to construction.	Will ensure protected species have not moved into the area. If evidence is found then SNH and the Scottish Government will be consulted and appropriate licences obtained as necessary.	Pre construction.	